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# *Archives of* **PHYSICAL MEDICINE AND REHABILITATION**

(Formerly Archives of Physical Medicine)

*Official Journal*

*American Congress of Physical Medicine and Rehabilitation  
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NO. 6

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# Contents — June, 1954

Volume XXXV

No. 6

## ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION

(Formerly Archives of Physical Medicine)

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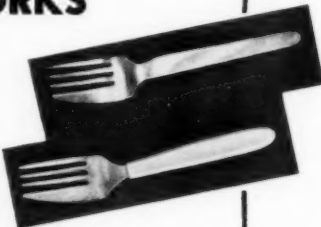
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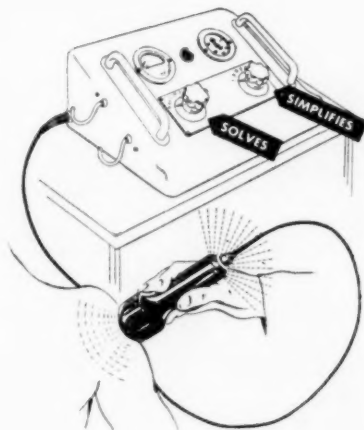
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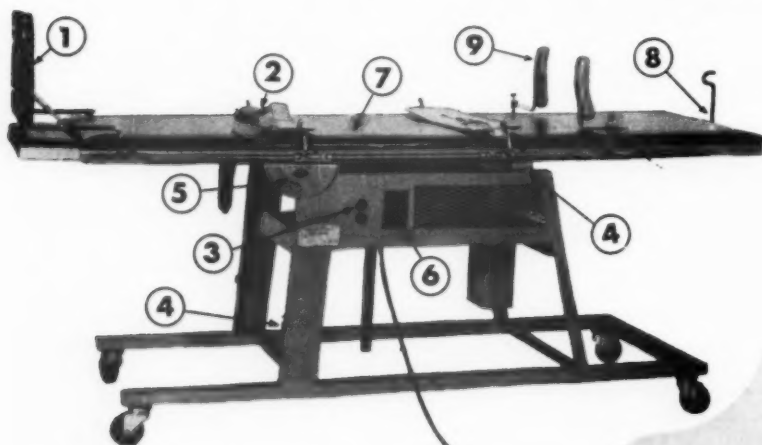
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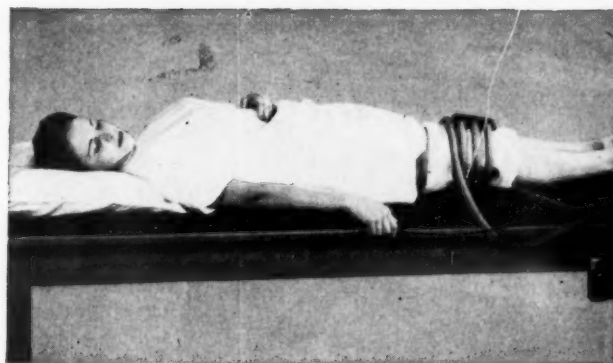


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# Some Psychologic Aspects of Prolonged Care in the Treatment of Poliomyelitis

Robert M. Peet, M.B., B. Ch.

Howard P. Rome, M.D.

and

Earl C. Elkins, M.D.

Rochester, Minn.

This report is an account of some of the problems encountered in the management of patients with the residuals of poliomyelitis. Its main focus is upon the special difficulties which arise in the sphere of interpersonal relationships among the patients, their special nurses, and the general-duty nurses as well as the various ancillary hospital personnel and medical attendants. The ramifications of these problems are extensive because of the multiple complications peculiar to this disease as well as the duration of the rehabilitation process, which requires a period of protracted hospitalization.

The physical aspects of the many complications which confront the physician in the management of patients with the acute and chronic forms of poliomyelitis are well known. However, the psychologic stresses which often jeopardize an otherwise excellent therapeutic regimen are less familiar. It was with the expectation of assaying these particular factors that the present inquiry was undertaken.

## The Background

During the summer of 1952, the incidence of acute anterior poliomyelitis in the geographic area served by our hospitals reached epidemic proportions. The high rate of bulbar involvement and peripheral respiratory paralysis brought with it the additional problem of nursing care in respirators. A total of sixty-five

patients required this special kind of care at one time or another during the course of their hospital stay; of these, seven female and five male patients required protracted care of this sort. In addition to a greater or lesser degree of involvement of musculature essential to respiration, these twelve patients had some major weakness of their extremities. They were observed and treated from the summer of 1952 to the spring of 1953. At the conclusion of this period, eight patients were completely independent of the respirator, three almost so, while one still required its constant use. The ages of these patients ranged from fourteen to forty-six years. Six of them posed extremely difficult problems in the management of their convalescence because of psychologic conflicts.

Prior to the undertaking of this special inquiry most of these patients had been seen in psychiatric consultation at various times because of obvious emotional distress. The general pattern of these reactions was sufficiently striking to obliterate minor personal differences and to emphasize major similarities. Further, our attention was focused on the psychologic cornerstone of these complications when a succession of abrupt changes in the private-duty nursing staff occurred coincidentally in three different sections of the department where these patients were hospitalized. It was a general feeling that the attitudes and dispositions of these patients were the main reasons for this rather unusual turn of events in a long-established nurses' registry.

Our presuppositions naturally led the search for an explanation of these phenomena in channels which we felt would be most productive. They took into con-

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sideration both the implicit and the explicit aspects. The former included the expectation of regressive behavior in whatever form possible for a patient wholly confined to a respirator and totally dependent upon three nurses for each twenty-four hour survival. Then, too, there were each patient's psychologic vulnerabilities — a legacy from past experiences, developmental, coincidental and traumatic. The unique psychologic response of each patient to an acute, painful, seriously crippling disease was presumed to be more or less of a typical neurotic decompensation of defenses capable of being expressed in a limited number of ways. The explicit aspects were obvious. As a rule there were two respirators in a double hospital room with one nurse in constant attendance for each eight hours of the day. The prescribed schedule of treatment required a routine which called for a division of nursing work among the three nurses for each two patients. A maximal amount of distractions occurred during the day: visits by medical attendants, physical therapists, families, friends and so forth. The variations in recovery between each two patients in the same room imposed greater or lesser demands upon the nurse for what might be considered preferential treatment.

Then, too, there were the elements which were contributed entirely by the nurse: her capacity for keeping up with an admittedly taxing burden of difficult bedside nursing, on a day-in-day-out basis; her emotional response to the often conflicting demands of two totally dependent patients; her reactions to the heavy task of co-ordinating the many jobs to be done and being constantly on the spot as a buffer, a whipping boy, an interpreter and a constant source of psychologic support and reassurance. To this difficult assignment the nurse brought her own value system, a composite of personal and professional experiences.

Another consideration was the setting in which this interplay of psychologic forces took place. Private-duty nurses in any large hospital are at a premium—

there is a constant demand for their services in considerable excess of the supply. This has the understandable effect of providing them with a relatively easy solution for a difficult situation. At the same time it charges the attending physician with the added responsibility of taking a more active role in nurse-patient affairs than he is disposed to take ordinarily. Finally, there is a different attitude prevalent among hospital personnel in the face of an epidemic. While it is akin to the acute consciousness of mutual interdependence which prevails during a large catastrophe, it differs in that the stress of co-operative effort must be borne over a longer period. Inevitably the failures of perfect co-operative effort are the more acute and elicit a commensurate reaction because of the corrosive effect of sustained tension.

### The Patient

If the uniquely personal problems of each patient are put to one side there remains a residue of psychologic stresses which patients with poliomyelitis who require care in a respirator share in common. These may be defined more sharply if they are grouped according to the three main stages of the disease in which they occurred.

First was the acute phase of the disease, in which the necessity of placing the patient in the respirator was usually obvious to everyone. Actually the critical turn of events in the progression of the disease was so impressive that this move seemed to relieve anxiety even though in the long run it added its own quotient of tension. The fact of uncertainty of life and death itself blotted out all other concerns. The catastrophic anxiety of air hunger seemed to have a physiologic basis which was in part palliated by the mechanical means used to overcome it. On the other hand, the tremendous fear of the respirator was associated with its literal connotations. Anxiety in the face of impending death has a proportionate quality born of an appreciation of the reality situation.

The second phase of the illness, a period of six to twenty-four weeks, was the first step in recovery after the acute critical period of the disease. The patient was transferred physically from the isolation wards to the open wards of the department of physical medicine. Here the respirator patients were placed in double rooms and cared for by one nurse to each room in eight-hour shifts.

In general, all patients reacted toward this phase of their illness with depression, irritability and anxiety. All patients admitted that this adjustment was a horrible ordeal. Some patients regressed to infantile forms of behavior. They were preoccupied with such thoughts as: would they ever get out of the respirator, would they ever walk again, would they be able to earn a livelihood, would their family accept their changed physical appearance and look after them in their now dependent position, would their spouses be unfaithful, would their children have forgotten them. The pregnant women were anxious to know: would they carry to term and would the baby be normal. The non-pregnant women were concerned about their amenorrhea.

In retrospect, it was seen that the austerity of the isolation wards clothed every-day anxieties with a protective blanket peculiar to all critical situations when life and death are the stakes. When the more striking evidences of the crisis were gone, the welter of conflicts which had been subsumed became apparent.

The third phase of the illness was that stage in which the patient's emotions came into equilibrium and an adjustment was made to the realities of his total situation. This stage was usually reached two to six months after the initial onset of the illness. It was evident to us that this adjustment was tenuous and could break down again under stress. This occurred in several patients.

#### **The Nurse-patient Relationship**

The importance of this relationship was seen clearly when it was recognized that not only did the patients develop psychologic symptoms but also their nurses showed the eroding effects of a

wearing job. Implicit in this statement is that an important element in the course of this disease is the interplay of feelings in all interpersonal relationships.

What, then, are the vectors which enter into such a relationship so that it assumes major importance? Why is the nurse-patient relationship more critical than other ones? After all, there are other interpersonal relationships to be considered in the total sociological situation of those with physical therapists, relatives, physicians and ministers. These are also important but less so because of the relative infrequency of contact. It is the nurse who is constantly with the patient. Thus, in the presence of psychologic decompensation particularly, time and propinquity promote the development of a transference of emotional conflicts to persons present without regard to their actual roles or even their conscious contribution to the patient's problem.

Each person begins life with different emotional and intellectual potentialities and capacities which are modified subsequently by his own unique interpersonal and other environmental experiences. In this instance, as one would expect, these patients and nurses reacted to this chance meeting according to their own unique personality traits. When purely fortuitous events fraught with emotional overtones occur, the participants react not only to the circumstances determined by the reality situation but also to the psychologic roles thrust upon them by the state of their emotional maturity. The interpersonal situation then is complicated by past conditioning as well as by present actualities. It is reflected in feelings which may be expressed, suppressed or repressed. Various derivatives of these feelings come into being, many of which bear no gross resemblance to the causative circumstances. Indeed, almost immediately the actual traumatic situation becomes vested with feelings of prior emotional conflicts which were incompletely resolved. Thus, psychologic compensation is a relative matter, the most important determinant of which is the past experience of the individuals.

Then, too, each new psychologic experience is relative in the sense that it is reacted to in a manner largely determined by what has gone before.

Hence in the face of a problem such as the one these patients and nurses encountered, the physician must look for elements far beyond the immediate ones. Only when he is possessed of this additional information is he adequately prepared to cope with the problem.

There is a latent period in which this process foment. The physicians in charge of these patients are often only dimly aware of "some upset," and being preoccupied with other duties they do not realize the magnitude of the feelings involved, much less their full meaning, until a nurse or a succession of nurses resigns from the case of the patient.

Observations on the ramifications of this relationship are described to show how its various facets during all three phases of respirator care are intimately related to the psychologic adjustment of these patients and nurses.

During the first, acute, phase of the disease it is understandable that most patients become excessively demanding of their nurses in an attempt to allay the catastrophic anxiety they are experiencing. Though the nurse at this time realized that many of the demands made upon her were unnecessary, she was cognizant of the fact that it helped the patient by meeting them and did so. The nurses were not aware of any conscious resentment because to them the patients were critically ill and in need of their help. It should be noted however that during the second phase of the disease the nurses' attitude toward these demands changed when their patients were no longer critically ill in a living or dying sense.

In this second phase the patients' and nurses' personality integration affects the psychologic adjustment of each. Those patients who appeared to bear their illness with fortitude (in group discussions which we held with the nurses) were referred to as the "good patients." From the point of view of psychiatric evalua-

tion, "good patients" could be placed in one of two categories. There were those with a history of emotional stability prior to their illness and those who were fundamentally passive individuals disposed to regress into a childlike dependency and thus willingly accept the nursing (maternal) care.

It was evident in two of these patients with well-integrated personalities that they were actively suppressing considerable resentment by reason of what had happened to them. However, in the face of the kindness bestowed upon them by motherly, kindly nurses who unceasingly tried to meet their needs, they were unable to express openly any resentment. The only evidence of this suppressed resentment was the guilt they felt because of it. This was completely buried in the clinical depression displayed. Parenthetically, the other extreme was seen in a group of excessively demanding patients. They were almost constantly critical of their nurses, and bitter in their condemnation of everything which they did. They invariably construed the things done *for* them as being done *to* them—as if their pain and discomfort were a purposeful objective of the medical and nursing attendants. Furthermore, their complaints extended beyond this to include caustic remarks about such personal items as the physical appearance of their nurses, their mannerisms and conventions of speech. This carping eventually found its target and when a retaliatory response was elicited, it was seized as confirmation of the nurses' punitive attitudes and thereafter retailed as proof of the allegation of mistreatment.

Even a superficial psychiatric inquiry into the reasons for this behavior was productive. It was evident that for years these patients had been in conflict with parents and siblings and later with spouses and children. The transfer of this to surrogates was obvious. By the same token when the physical pains and pressures were coupled with the enforced dependence, they were almost totally deprived of the few outlets they had had

to leech off anxiety and its many congeners.

The physical circumstances of two patients bound to respirators, in the same room, dependent upon a single nurse conduced to an exacerbation of old unresolved conflicts; for here again was a triangular situation reminiscent of childhood. The nurse of necessity bore the brunt of this problem for which as they often put it: "There was no good reason." The slightest incident was taken as a pretext for an explosion of vitriolic denunciation and condemnation. One patient graphically described this aspect of convalescence as, "a stage of irritability, nothing satisfies you, you are mad at the whole thing, helpless, unable to do anything about it."

One nurse voiced the typical effect of this emotional discharge upon others when she said in a group discussion: "I could take it at first as I understood why the patient was so mean, but after some weeks, day in and day out, I got so mad that I would walk out and cool off. Then from outside the ward I could hear the patients giving off about me. But I realized they didn't mean it, so I just perked up and went in again. However, after a month of this, I found I was taking it home to my family and even dreaming about it. So you see how it can affect you."

Interpersonal relations are at the least a two-way street. In recent years it has been recognized that medical attendants contribute considerably to the therapeutic progress or delay of convalescence of their patients. This contribution is conscious and purposeful, as well as unconscious and inadvertent. The feeling of the patient for the nurse or the physician is only half of the whole story. Hence, in an inquiry into the dynamics of interpersonal relations, all aspects of the situation have to be explored. In this connection, the reasons for the successful management of problem situations often shed light on the less successful endeavors. Then, too, success is a relative matter. Not always are the same techniques equally efficacious.

It was apparent that one of the more successful nurses in the management of the constant bickering between immature patients was a firm but kindly woman who settled all disputes when they arose by emphatic, authoritative decisions which were unequivocal. With this firmness, she was able to help resolve this demonstrative regressive tendency by a parental kind of technic. However, as the patient improved and the nursing was reduced to a routine type of bedside care, she requested a change of duty. She frankly admitted that she was not happy unless she was caring for critically ill patients. What she was saying in effect was that she felt most secure when her penchant for authoritarianism was unchallenged. When she could handle patients as if they were naughty petulant children, she satisfied some need of her own. When her patients were more critically ill, their regressed psychologic state made them ideal candidates for this kind of management. However, as they recovered and expressed the growing psychologic independence they felt, these techniques were neither needed nor appropriate.

Perhaps the most trying situation was one in which the antithesis occurred. The nurse who for conscious and unconscious reasons of her own failed to make decisions invariably fomented minor disputes among her patients into major ones. To summarize in an oversimplified fashion the dynamics she employed, it can be said that her indecision communicated a permissiveness to the patients to express angry, hurtful feelings which she nominally denied by inactivity. This assumption was further substantiated by her tactic of repeating in unnecessary detail what so and so said and what was answered in reply. The problems created by the nurse who clothes her lack of appreciation of the patient's problem in technical proficiency are equally important. In regard to one such nurse, her patients volunteered that "she was excellent technically"; however, they were afraid "of her hot temper." This nurse was a close friend of the nurse whom she had just relieved.



The following is a condensation of a statement made by one of their patients during the course of a psychiatric interview.

"Nurse makes me eat food I don't like. I am sick after it. She knows I can't take it. Nurse was so mad when I refused last time. I don't dare to get mad at her as she gets so mad then. Nurse said from now on you don't have to eat, you can be skin and bones for all I care. I would like to poke a few things down her mouth. She goes into other rooms and bawls other patients out, too."

A later interview with this patient concerning this nurse and her friend furnished the reason for the continuation of the strife even though the key figure had been removed.

"We didn't like the previous nurse so we decided to give her a bad time in fun one afternoon. She became hysterical (ran out of the ward crying) and left the case. Our present nurse came in and told us off in no uncertain terms in front of my husband. We have her now." It is evident from this that a hostile patient can break down a nurse's psychologic adjustment, just as a hostile nurse can further burden a hostile patient. Further, allegiances and alliances of various sorts can serve to perpetuate interpersonal conflicts.

Group opinions among the nurses were of major importance in understanding why a succession of new nurses would remain with one particular patient for progressively shorter periods before resigning from the case. This patient addressed her nurses in a most hostile manner: "Do this, you cow; do that, you pig," and so forth. While it is obvious that most persons will not tolerate this kind of verbal abuse for long, it is not immediately clear why each new nurse stayed for a progressively shorter period of duty. It was revealed during a general group discussion that the prospective relief nurse heard so much about this patient at dinner-meal gossip that she was convinced she could not stay for more than a day. Thus, the stage was set before the actors appeared. Other

nurses volunteered the same information. At this point all the potential nursing staff had identified with this patient in such a hostile fashion that it was incumbent upon the patient's physician when he was informed of the facts to tell her that unless she behaved in a more mature manner, she would be without nursing care. This had the expected effect of converting acted-out anger to depression; in this state she was passively co-operative. In turn, this assuaged the nurses' feelings. Fortunately, her physical status gradually improved and she was helped to make a better psychologic adjustment.

The third phase of the disease was that in which the patient finally settled down and adjusted to his total situation. This adjustment was often a marginal one, and a change in the nurse-patient relationship on several occasions precipitated a complete breakdown of this adjustment. Thus, about six months after the onset of their illness, two female patients whose psychologic adjustment to their illness was by and large a tenuous one became quite anxious, depressed and lacrimose. An investigation of the situation revealed that one of their nurses who had been with them for several months had left four days previously. They had become very attached to her and expressed some resentment about her leaving. The nurse who substituted had stated to the supervisor that she really did not want this type of nursing. Reluctantly, she was persuaded to undertake it for a few weeks until another nurse was found to replace her.

With this as an introduction, she visited the ward several days before the change. She met the patients and was instructed in the type of care they needed. The day before beginning her period of duty, the nurse who was being relieved said: "Now you must be firm with them from the first, they told me they just hate you." Within a few days both patients and nurse became very disturbed. This nurse stated that these patients upset her more than any patients she ever cared for. Biting her lip, she



said that they seemed determined to get rid of her but they would not for she had pride in her service record. Both patients were described as being very mean, which was the same term the patients used to describe her. During the course of an interview, this nurse came to see her resentment and was able to relate it to her introduction and the gratuitous remark. The problem was also reviewed with the patients by the physician. The room ran smoothly after this but the nurse resigned in a few days because she realized that her feelings as well as the patients' were not completely resolved. However, she was able to feel comfortable about prematurely terminating her period of duty.

In general, it is obvious that if the personality traits of the patients and their nurses are not compatible, some conflict is likely, especially during the stressful second stage of the disease. The nurse who has a need to satisfy her own deep feelings of guilt is able to allay it by spoiling her patients with overindulgent care. However, the balance between the feelings masked by guilt is a precarious one when for a variety of reasons it is shaken. Solicitude and indulgence are turned into their opposites and expressed in such ways as telling a new unprejudiced nurse, "They hate you."

With these general conclusions in mind, a series of group discussions for the nurses was arranged. In addition, to dilute the intensity of the nurse-patient relations, new social contacts for the patients were made through a voluntary Gray Ladies group under the auspices of the American Red Cross.

In regard to group discussions, the physician took a passive role, allowing the nurses to discuss freely their problems with the patients, as well as to comment upon their colleagues' problems. Through this medium of free discussion, the participants were able to gain some insight into their difficulties and learn the ways in which the more skillful nurses handled patients. Some of the group were surprised to learn that the resentments of these patients were di-

rected at random because of what had happened to them. Furthermore, since anxiety is whetted by an open demonstration of hostile feelings, they were relieved to learn that certain of the responses were normal reactions to the situation in which the patients found themselves. They learned to rationalize the situation by saying, "Well, these feelings are not really meant for me so I don't have to get upset." Some of the group were able to see how problems within themselves and events in their private lives were related to emotional reactions in their patients. Of course, this was a superficial insight; there was no intention of exploring the more extensive ramifications. By the same token, no effort was made to convert a simple discussion group into a formal psychotherapeutic one. The limitations of goals as well as time and personnel restricted this inquiry to an explanation of potentialities in this direction.

It was evident that if the number and kind of social contacts of these patients could be enlarged, another outlet would be provided and the burden upon the nursing staff would be less. This was done by introducing a voluntary ladies group to read books and write letters for the respirator patients for one hour, five days a week. This was undertaken by the Gray Ladies of the local chapter of the American Red Cross, and was singularly successful. It soon developed that these informal sessions led to the establishment of a very close relationship between both participants. Reading was often omitted and "friendly chats" took its place. Remarkable improvement was quickly noted in these patients previously looked upon as presenting difficult management problems. One patient in particular became quite placid, put on weight and rapidly progressed in her rehabilitation program. The importance of this relationship to her was highlighted when a conflict in her schedule caused her to miss an anticipated visit from her Gray Lady. Following this, she was again petulant and uncooperative until the error was rectified.

The Gray Ladies group was characterized by the motivation to help, a sense of obligation and a neutral, nondemanding friendliness. Under these circumstances, freely given kindness and help from such a source was extremely gratifying to dependent patients. The beneficial aspects of this addition to convalescent care are well known and have been used with equal success in analogous situations. This pilot use of such ancillary personnel points up the need for a more definitive study of group dynamics which contribute to the success.

### Comment

Naturally one looks for clues from a study such as this which might be helpful in preventing a repetition of these events. In a summary fashion, they include the anticipation and recognition of the acute anxiety of the first stage which can be handled by positive reassurance and by a spontaneous response to the many demands which are made. In the second stage of the disease, an evaluation of the personalities of the patients is helpful in planning a rehabilitation program designed to minimize psychologic stress. An effort should be made to educate the nurse and all other attendant personnel. This can be done only if they learn to be more accepting of the resentment these patients have and learn why it appears to be directed mostly toward the nursing staff. In a well-designed program, it is necessary for the entire staff to learn how their own problems react upon the patient. Nurses and others working in the same ward may have problems among themselves which are reflected in the nurse-patient relationship. Changes in ward personnel have to be planned to avoid undue stress upon the patient or the substitute. It is helpful if the patient is informed of the change in advance in order to allow an opportunity to work through some of the resentment and anxiety felt about the separation. Group discussions early in the second phase will assist in

precluding the development of many problems. At this time, the patient's planned social contacts contribute a great deal to a better emotional adjustment.

### Summary and Conclusions

The psychologic reactions of respirator patients with poliomyelitis are described in three stages of disease.

The various facets of the social relationships of patients needing long-term respirator care are important in making a satisfactory psychologic adjustment. Because the nurse spends most time with patients, this interpersonal relationship can assume major importance. To understand the total situation it is necessary to recognize that doctors, nurses and patients each have individual personalities and each can become emotionally disturbed in relation to one another. Some of the psychodynamics of these relationships are discussed.

The nurse-patient relationship is an example of an important factor that may help the patient progress to further goals of rehabilitation or it may be a hindrance to such progress.

Education of the nurses through group discussions is a very helpful therapeutic measure that favors a better nurse-patient relationship.

The introduction of new social relationships into the ward has proved to be very effective in helping difficult patients to adjust.

The salient features of a planned program are mentioned.

### Discussion

Dr. Jack Meislin (Montrose, N.Y.): This paper deals primarily with nurse-patient relationship. We can substitute for it the more generic "therapist-patient" relationship, which is of paramount importance in every phase of medical care. It is of specific interest to me personally. In fact, practically the entire course dealing with psychiatric aspects of physical therapy, which I offer to physical therapy students at the

College of Physicians and Surgeons, is based on this concept.

The general socio-psychological somatic effects that this relationship may produce are fairly familiar to all of us, although their significance is not always appreciated. There is another aspect of therapist-patient relationship which has not yet been specifically described—and that is its role in the treatment of a local condition. Experiments have shown that emotional stress produces muscle tension, diminution of muscle blood flow, increase in the viscosity of the blood, and decrease of tolerance to exercise. It becomes obvious that in these cases, the treatment of an organ by such physical measures as massage and exercise, for instance, would not be very effective.

It is in consideration of these effects of general and local nature that a statement made by the authors early in the paper can be fully evaluated: that "the psychologic stresses . . . often jeopardize an otherwise excellent therapeutic regime . . ." I might add that too often they also jeopardize the very life of the patient.

Time limitation does not allow discussion of the respirator patient's reactions so vividly described. Among others, the sibling rivalry, the vicious circle of air hunger, the initial fear of that monster—the respirator, the dependency—overcompensated by arrogance, and the projected apprehensions. In my opinion, not all of the latter are attributable to infantile regression. It is questionable whether we are dealing here with phenomena specific to respirator patients. Discussion will be limited to the part played by the nurse. The anxieties and emotional needs of the nurses reflect themselves in the progress of the patients. In discussing this with several nurses who treated patients in respirators, it was interesting to learn that the availability of a very competent *charge* nurse, particularly at night, helped relieve much of the anxiety of both nurses and patients.

The case of the motherly nurse, described by the authors, is of special in-

terest. Female nurses, physical therapy students, and other medical personnel have to be cautioned during their training period that, perhaps, one of the reasons they chose these professions was the emotional need to satisfy their maternal instincts. The criterion of professional maturity for them is the degree of insight into this and ability to offer their services more or less objectively. However, the supervising physician can often be of great assistance. In writing his prescription or nurses' orders, the physician should mention the type of attitude to assume which will be most beneficial to the patient. The important facet is that this prescription be dynamic and not single or static. As the patient improves, the attitude prescription must change accordingly. During the acute phase of the patient's illness he should feel that he *can depend* upon the competent and broad shouldered nurse. As he improves, he must be prepared to become more and more independent and self-sufficient. The crux, and the difficulty, of the problem is to make this transition gradual and well-understood, as well as properly managed by the nurse. Therefore, frequent guidance by the physician is necessary in addition to the paper prescription. It is this guidance and the very important "insight therapy" sessions described by the authors in addition to the usual regimen that are going to result in a realistic medical approach to the patient as an individual.

Doctors Peet, Rome, and Elkins have made a much needed contribution to medicine in their valuable paper. They are to be congratulated.

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# Relation of Stimulus Frequency and Sensory Nerve Supply to the Tension Developed in Normal and Denervated Muscle by Electrical Stimulation

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It was shown, in previous studies, that when the sine wave was used to stimulate the normal human muscle electrically the maximal amount of tension was developed by the muscle when the stimulating frequency was approximately 60 to 100 cycles per second (cps), provided that the current intensity was kept constant over a wide frequency range<sup>1</sup>. This was a result which was predictable and explainable on the basis of available information concerning irritability of striated muscle and motor nerve<sup>2</sup>. Yet, from the pragmatic standpoint, this is not sufficient information for therapeutic purposes. To derive maximal benefit from electrical stimulation of the denervated muscle it might be desirable not only to compare different frequencies at identical current intensities, but also to compare them while using the maximal amount of current which can be tolerated at each frequency.

The reason for this change in emphasis and orientation is the fact that the development of muscle hypertrophy and strength depends upon the amount of tension exerted by muscle during contraction<sup>3-5</sup>. Thus, it may be more important to determine the frequency at which one develops the greatest amount of tension, irrespective of the amount of current given, rather than to know the frequency at which one develops the best contraction per unit quantity of current. A comparison was therefore made between currents of various types in order to determine which one was the most efficacious from the standpoint of the

amount of tension which could be developed by the electrically stimulated muscle.

Since high isometric tension was desired, it was of advantage to determine the effect of the sensory component on the amount of current which could be tolerated and on the amount of tension which could be developed. Hall<sup>6</sup> found, for example, that the amplitude of muscle contraction produced by stimulation of the peripheral end of a cut ventral root of the cat could be decreased by the application of hot packs over the muscle concerned. If the skin is anesthetized with butyl aminobenzoate (Butesin) before the hot packs are applied, this decrease is not manifest. Further studies concerning the relation between sensory supply and muscle contraction were carried out in the human, with procaine (Novocaine) ion transfer serving as the mechanism for superficial sensory block<sup>7</sup>. Ion transfer was accompanied by a decrease in the amount of tension produced by direct electrical stimulation of the muscle. It was found, however, that this tension decrease was not necessarily produced by any anesthesia resulting from procaine (Novocaine) ion transfer, for the passage of the constant current in itself caused a decrease in the amount of tension which could be developed on direct electrical

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stimulation, both in the human and in the frog striated muscle<sup>1,10</sup>. In this study, therefore, an attempt was made to eliminate superficial sensation over the area to be stimulated electrically by the use of a Novocaine field block.

In summary, then, the purpose of this study was to determine which of several currents produced the greatest amount of tension in the human striated muscle that was stimulated electrically, and to determine what effect a sensory block would have on this tension development.

### Methods

Isometric tension was recorded by means of a strain gage system and a Leeds Northrup d.c. amplifier. The gage elements (SR4, type A-1, resistance approximately 120 ohms) were cemented to a metallic ring or bar, in Wheatstone bridge fashion<sup>11</sup>. Three types of gage systems were used, depending upon the muscle group tested and the strength of the muscle. In the first the strain gages were attached to an aluminum alloy ring approximately 4.8 cm. in diameter and 3.2 mm. in thickness; in the second they were attached to a steel bar 30 cm. long, 2.6 cm. wide, and 8 mm. thick; while in the third they were attached to a steel bar 30 cm. long, 2.6 cm. wide, and only 0.6 mm. thick. The latter system was used in all tests of 'O' and 'I' muscles, and occasionally in studies of '2' muscles.

Electrical stimulation was applied with a standard variable frequency sine wave stimulator (Model CD7, Teca Corporation, New York, N.Y.), using frequencies from 2 to 2000 cps, and a low voltage stimulator in which the rate of rise and fall of current are much more rapid than with the sine wave (Medcotron, model 50 low volt generator,

Medco Products Co., Tulsa, Okla.) (fig. 1). To avoid any indication of its manner of production, the latter current will be referred to as the 'spike.' As used in this study there were either 1000 or 2000 'spikes' per second. Both the sine wave and the 'spike' were surged, so that there were approximately 10 to 12 contractions per minute, though only a few contractions were actually elicited at each frequency, so that fatigue might be avoided or minimized.

The elbow flexors and the quadriceps were the only two normal muscle groups used in this study. For study of the elbow flexors the arm was abducted 90 degrees, and the forearm flexed to 90 degrees and pronated. This had been the angle found, on the average, to be optimal for the development of isometric tension on voluntary contraction<sup>11</sup>. The stimulating electrodes were 2 cm. in diameter, and both were placed on the flexor surface of the arm so that a line joining them was parallel to the longitudinal axis of the arm. The contractile force was applied to the strain gage system through a sling into which the forearm was inserted. The distal margin of the sling was at the level of the medial malleolus.

For study of the quadriceps, the optimal knee angle for voluntary isometric tension had first to be determined. The subject was in the sidelying position, with the hip in 35 degrees of flexion (neutral position—zero). The angle at the knee was varied from 60 to 150 degrees (complete extension—180 degrees), and the maximal voluntary isometric tension was recorded at intervals of approximately 20 degrees. The muscle force was applied to the strain gage system at the level of the ankle. When the optimal angle for voluntary contrac-



Fig. 1 — Cathode ray oscillograph representation of the 1000 per second 'spike' on the left, and of the 2000 per second 'spike' on the right.

tion had been determined on any one subject, electrical stimulation of the quadriceps was then given with the knee kept at this angle, but with the muscle force now applied to the strain gage system 5 cm. distal to the distal end of the patella. The electrodes were large rectangular ones, 8 x 13 cm., and both were applied to the extensor surface of the thigh.

In the patients with poliomyelitis, in addition to the muscles mentioned, the gastrocnemius, tibialis anterior, triceps, carpal flexors and extensors, flexor digitorum profundus, flexor and extensor pollicis longus, and abductor digiti quinti were also studied. For the gastrocnemius, two rectangular electrodes, 5 x 5 cm., were placed over the calf muscles. For the other muscles there was a distant inactive electrode, and a 2 cm. diameter active electrode that was moved over the muscle until maximal contractions were produced. This position was then kept constant throughout the experiment.

In study of any one muscle with the sine wave and 'spike' at various frequencies, special care had to be taken to keep the joint angle, the electrode positions, and the point of application of the muscle force to the strain gage system constant throughout the observation. The order of application of the electrical stimuli for different muscles and subjects was randomized, so that no one frequency or current type was uniformly in the same positional sequence.

Anesthetization of the skin area under the electrodes was achieved by field block with one per cent Procaine on the flexor surface of the arm. Electrical stimulation was done over this area with intact sensation, and again after block had abolished all surface pain and touch sensation.

All the foregoing observations were made on normal subjects or on patients with poliomyelitis. In addition, a few preliminary observations were made on anesthetized dogs. Nerve action potentials of the mixed sciatic nerve in the popliteal fossa were taken with a standard amplifier, cathode ray oscillograph

and camera. The nerve was exposed, wrapped in plastic film, with platinum electrodes placed under the film. The calf muscles were stimulated through the shaved skin, with a variable frequency condenser discharge.

## Results

*A. Isometric Tension Developed on Electrical Stimulation of the Elbow Flexors in the Normal Subject.*—Sixteen observations were made on eight normal subjects (one male and seven females). Stimulation was with a 1200 and 2000 cps sine wave, and a 1000 and 2000 per second 'spike.' Since no significant differences which depended upon frequency were noted, the results for the 1200 and 2000 cps sine wave were combined, while those for the 1000 and 2000 per second 'spike' were combined. In this group two end points were used. At first the subject was asked to take as much current as he could tolerate comfortably, taking into consideration the necessity for returning daily for similar treatment (comfort end point). After isometric tension readings were taken at this end point, the current intensity was increased through a region of discomfort until pain was produced (pain end point), and tension readings were again taken.

At the comfort end point, the average isometric tension reached with the sine wave was 10.2 pounds  $\pm$  1.9 pounds (standard error of the mean), while with the 'spike' the mean was 10.2 pounds  $\pm$  1.7 pounds. The mean peak to peak voltage for the sine wave was 57.1  $\pm$  1.8, while for the 'spike' the mean peak to peak voltage was 117.0  $\pm$  4.4. If the current was then increased until the pain end point was reached, the average isometric tension was 13.1 pounds  $\pm$  1.5 pounds for the sine wave, and 15.6 pounds  $\pm$  1.8 pounds for the 'spike.' This represents a twenty-eight per cent increase in tension for the sine wave, and a fifty-three per cent increase in tension for the 'spike' in proceeding from the comfort end point to the pain end point. The increase in tension for the 'spike,' though marked,



was not statistically significantly greater than the increase for the sine wave. At the pain end point the peak to peak voltages were  $65.6 \pm 1.4$  for the sine wave, and  $171.1 \pm 5.1$  for the 'spike.' This represents a voltage increase of fifteen per cent for the sine wave, and forty-six per cent for the 'spike' in going from the first to the second end point.

It is very difficult to evaluate satisfactorily observations made with a subjective end point. If interpreted with caution, then one can only conclude, from the studies in this group, that in the normal individual, treated with currents that can be well tolerated from day to day, there is no difference between the sine wave and the 'spike' at frequencies of 1000 to 2000 cps, as far as the amount of isometric tension which can be developed on stimulation of the muscle is concerned. There seems to be a greater margin between comfort and pain with the 'spike' than with the sine wave. This could not, however, be confirmed statistically, and further observations would be needed in this area.

**B. Optimal Angle at the Knee for Maximal Voluntary Isometric Tension.**—Ten normal female subjects were used in this study. As noted in figure 2, the optimal angle, on the average, was 105 degrees. There was a rather wide scatter, however, with two subjects favoring 75 degrees, three favoring 90 degrees,

four favoring 105 degrees, and one favoring 120 degrees. Because of this variation, in the following study on patients with poliomyelitis, voluntary motion was first studied at angles from 75 to 120 degrees, and electrical stimulation was then given at that angle which was optimal for each subject.

**C. Isometric Tension Developed on Electrical Stimulation in Patients with Anterior Poliomyelitis.**—Only patients with illness of three to six months duration were studied. Thirty-nine observations were made on thirteen patients. Eight 'O', five '1', (Trace) eight '2', (Poor) seven '3', (Fair) and eleven '4' (Good) muscles were tested. No significant differences were detected between the 'O' and '1' muscles, and between the '3' and '4' muscles, and these groups were combined as 'O-1' and '3-4'. Furthermore, not enough observations were made on any one muscle, so that the results of studies on all muscles of the same strength were combined.

Because of this grouping of muscles of such different size, it is the relative values for tension and tension per unit current that are presented graphically (fig. 3 and 4). Relative tension was obtained in the following manner. In any one experiment, the muscle tension was obtained on sine wave stimulation from 2 to 2000 cps, and on 'spike' stimulation at 2000 cps. That frequency at which

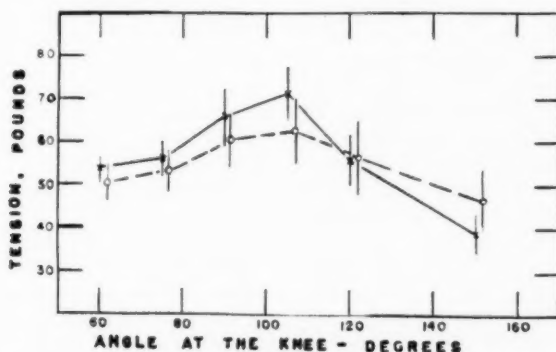


Fig. 2 — The effect of varying the angle at the knee on the tension developed by the knee extensors. The crosses represent values for the lower extremity on the same side as the favored upper extremity; the open circles represent values for the lower extremity contralateral to the favored upper extremity, and the vertical lines represent one standard error from the mean tension.

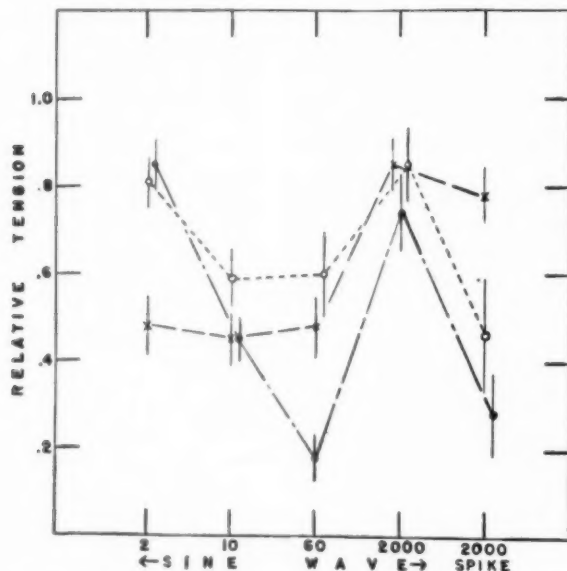


Fig. 3 — The effect of stimulating frequency on relative tension. Crosses represent '3-4' muscles, open circles '2' muscles, and closed circles '0-1' muscles. The vertical lines represent one standard error from the mean relative tension.

the highest tension was obtained was given a relative tension value of 1.0, and the other frequencies were given proportionately lower values. These were then averaged to give the relative tension values recorded in figure 3. As noted in figure 3, the tension developed by the '3-4' muscles was significantly greater ( $p < .001$ ) at 2000 cps, for both sine wave and 'spike,' than at the lower frequencies. For the '0-1' and the '2' muscles, on the other hand, the tension developed at 2 and at 2000 cps (sine wave) was significantly greater ( $p < .001$  for '0-1' and  $< .05$  for '2') than that developed at the other frequencies. Viewed from another standpoint, good tension was produced by 2 cps in muscles of '2' strength or less; by 2000 cps, sine wave, in all muscle groups; and by the 'spike' in muscles of '3' strength or stronger. It should be cautioned that the term 'good' can be used only relatively here, in comparison with the other frequencies and wave forms studied.

When the tension developed by a unit amount of current (tension-current ratio) is considered, however, the picture

is modified to a large extent (fig. 4). In the normal muscles (data computed from previous studies<sup>1</sup>) the optimal frequency is 60 cps; in the '3-4' muscles there is no significant difference from 2 to 2000 cps; while in muscle groups of '2' strength or less 2 cps is significantly better than any other frequency tested, with the preponderance of effect being greatest for the weakest muscles.

From table 1 it may be noted that almost twice as much current could be tolerated at 2000 cps as at any of the lower frequencies ( $p < .001$  for the difference between 2000 cps and the lower frequencies). No difference was noted, in this respect, between the weaker and the stronger muscles.

*D. Effect of Field Block on Isometric Tension Resulting from Electrical Stimulation.*—These observations were made on the elbow flexor group of seven normal male subjects. As noted in table 2, there was, at the higher frequencies (1000 to 2000 cps), a marked and significant decrease in the isometric tension which could be developed by the electrically stimulated muscle after the field

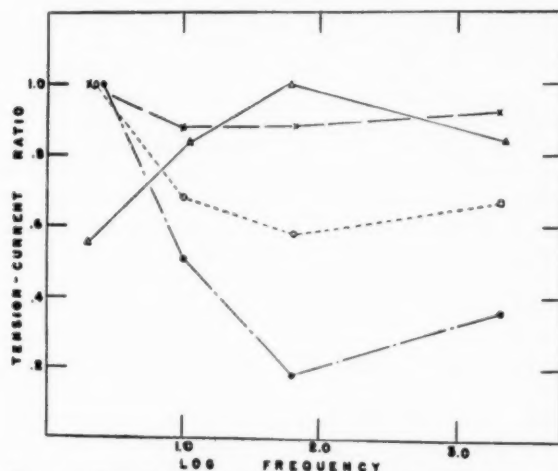


Fig. 4 — The effect of stimulating frequency, for the sine wave, on tension-current ratio. Triangles represent '5' muscles, crosses '3-4' muscles, open circles '2' muscles, and closed circles '0-1' muscles.

block. This was true for both the sine wave and the 'spike', notwithstanding the fact that there was a significant increase of approximately twenty per cent in the amount of current which could be tolerated. At 10 and 60 cps, however, there was an average, but not statistically significant, increase in the amount of tension which could be developed on electrical stimulation, and a marked and significant increase of approximately eighty-five per cent in the amount of current which could be tolerated. This latter increase was so great, that while the amount of current tolerated at 1200 cps was much greater than at 10 and 60 cps before field block, the tolerance was almost exactly the same at all the frequencies studied after the field block.

These observations strongly suggested that, in the electrical stimulation of muscles in the human by direct application of the electrodes over the muscle, a sensory reflex component was extremely important in determining the magnitude of the isometric tension which was produced.

*E. Nerve Block in the Anesthetized Dog.*—Further, but not conclusive, evidence for the existence of such a sensory reflex component was provided as a result of preliminary observations made

on three dogs. Briefly, the technic followed was to record action potentials from the mixed sciatic nerve in the popliteal space on direct stimulation of the calf muscles, with the stimulating electrodes placed on the shaved skin over the muscle. The mixed nerve proximal to the pickup electrodes was then blocked with two per cent Procaine. Now on direct stimulation of the muscle electrical activity of the nerve was markedly diminished or absent, suggesting that the electrical activity which was initially recorded in the nerve was mainly or entirely a manifestation of reflex activity. No attempt was made to quantitate the strength of contraction. In one instance, however, after observations had been recorded concerning the effect of Procaine block, the mixed nerve was sectioned at the site of the block. The tension which was now developed by the directly stimulated muscle was extremely slight.

#### Discussion

The results of this study follow logically from those which have been carried out previously. Coppee<sup>8</sup> and others have shown that excitability of normal motor nerve and striated muscle is maximal at approximately 60 to 100 cps (sine wave), whereas denervated and

poliomyelitic muscles have their lowest threshold at frequencies lower than 10 cps<sup>12</sup>. Figure 4 shows that the tension-current ratio follows very closely these excitability relationships, with a progressive shift of the high point on the curve to the lower frequencies as the muscle strength decreases in the patient with poliomyelitis. This indicates the importance of the excitability factor in the production of tension in a situation in which the strength of stimulus is constant and submaximal.

When considering total tension developed, however, one must consider not only excitability (threshold-frequency relation) but also pain sensitivity (pain-threshold frequency relation) and the amount of current which can be tolerated. Rose and Mead<sup>13</sup>, determining pain thresholds in the normal human, found current tolerance to be higher at 2000 cps than at 500 cps, the lowest frequency illustrated graphically in their study. In the patients with poliomyelitis studied here, twice as much current could be tolerated at 2000 cps (sine wave) as at the lower frequencies. This has the effect of raising the relative amount of tension obtainable at 2000 cps, so that doubling the 2000 cps points in the threshold-current ratio curve (fig. 4) should result in a curve which approximates that in figure 3.

From the therapeutic standpoint, it is evident that tension development is best achieved with 2000 cps—for both sine wave and 'spike'—in the '3-4' muscles. For '2' muscles or weaker, the 'spike' no longer produces adequate tension, whereas the sine wave of the same frequency is still adequate. This is probably due to the fact that, with the increase in chronaxie of denervated muscle, the rate of change of current in the 'spike' is too great to stimulate adequately the muscle fiber. In addition to the 2000 cps sine wave, however, one now has, for the weak muscles, the choice of the 2 cps current as well. On theoretical grounds, the choice should depend, to some degree at least, on the picture of the surrounding muscles. If

all adjacent muscles are of the same strength, there may be little difference between 2 and 2000 cps (sine wave), the choice depending to a large extent on the preference of the patient. If, however, the weak muscle is surrounded by stronger ones ('3' or better), spread to the stronger muscles may be avoided or minimized by stimulating the weak muscles with the lower frequencies (2 cps).

In addition to excitability and current tolerance, the reflex pathway plays an important role in determining the tension developed by muscle on percutaneous electrical stimulation. At high frequencies there was a marked and significant decrease in isometric tension after field block, even though there was a twenty per cent increase in current tolerance. At lower frequencies, however, there was a much lower current tolerance before field block, and the sensory block produced such a marked increase in the amount of current which could be given (81-85 per cent) that the tension produced was not significantly changed by the block. Further evidence indicating the importance of the reflex component is present in the decrease in electrical activity in the mixed nerve of the dog on block proximal to the point of recording. A similar interpretation was arrived at by Sassa and Sherrington<sup>14,15</sup> following their studies with the exposed tibialis anticus muscle of the cat. They found that electrical stimulation of the skin or appropriate afferent nerve produced much greater isometric tension than did motor nerve stimulation.

Thus, in evaluating the muscle tension to be obtained on percutaneous electrical stimulation in man, one must consider, at least, the factors of excitability of muscle, current tolerance, and reflex pathways.

### Summary

Identical levels of isometric tension are reached on electrical stimulation of the normal elbow flexors with the sine wave and 'spike' at frequencies of ap-

proximately 1000 to 2000 cps.

In patients with poliomyelitis, greatest tension was produced in the '3-4' muscles by the sine wave and 'spike' at 2000 cps; and in the '0-2' muscles by the sine wave at either 2 or 2000 cps.

Curves relating tension per unit current to frequency paralleled, in general, excitability curves, with a peak, for the normal muscles, at 60 cps, and a progressive shift of this peak to the lower frequencies as the muscle strength, in the patient with poliomyelitis, decreased.

Sensory field block increased significantly the amount of current which could be tolerated, but either decreased the amount of tension developed—at the higher frequencies—or resulted in no significant change in tension—at the lower frequencies.

The relation of excitability, current tolerance, and reflex effects, to tension development on electrical stimulation of muscle percutaneously, is discussed.

Table 1: Relative Current Tolerance of Patients with Poliomyelitis to Sine Wave of Various Frequencies

Frequency, cycles per second	2	10	60	2000
Relative current tolerance	0.5	0.5	0.6	1.0
Standard error, mean	0.05	0.05	0.05	0.08

Table 2: Effect of Field Block on Current Tolerance and on Tension Produced by Electrical Stimulation of Muscle

Type of Current	Frequency, per second	Per cent Change in Current Tolerated (Mean)	p	Per cent Change in Isometric Tension After Field Block*	p
Spike	2000	+17	.02	-30±6.8	<.01
Spike	1000	+20	.01	-26±6.3	<.01
Sine Wave	2000	+20	.02	-42±8.0	<.01
Sine Wave	1200	+24	<.05	-36±8.6	<.01
Sine Wave	60	+85	<.01	+21±15.0	.2
Sine Wave	10	+81	<.001	+7±6.1	.3

\* Figures represent the mean ± 1 standard error

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### Discussion

Dr. Disraeli Kobak (Chicago): I had the privilege of reviewing this highly informative contribution at my leisure, instead of trying to digest its content in the short space assigned to its presentation. Such an opportunity has its special advantages when evaluating the logic of its exposition with its interwoven statistical data. It leads to a sharper perspective of the authors' thesis and evokes through the law of association some forgotten but relevant historic events in the genesis of this subject. I refer to the invention of the sine wave current by d'Arsonval of France in the latter part of the nineteenth century, who became famous for his discovery of diathermy and the string galvanometer associated with his name.

In discussing the trend of interest in the neuromuscular response of normal and denervated tissue, it is timely that we recall the contributions of this pioneer, first to study the effect of the sine wave current under varying frequencies which no doubt was partly responsible for its innovation and initiation in other sectors in succeeding years by investigators whose contributions have left an indelible impression on our own time. The greatest possession of any institution and exemplified by our Congress is not in the wealth of its membership but in the men who have humbly labored in its service to contribute significantly in extending our knowledge of the processes which control the excitation and inhibitions of neuromuscular response in normal and pathologic tissue. It is an honor to be an alumnus of such a

famous fraternity whose roster to mention a few include the names of Waller, Sherrington, Hill, Adrian, Erlanger, Gasser, as well as those authors whose studies were published in our official *ARCHIVES*.

The importance of this problem is so apparent as to call not only for a summary but also for a clear conclusion to give it the needed therapeutic direction. The clinician who is concerned with the restitution of the abnormal to the normal is highly interested in knowing which of the two instruments is the logical choice of the authors for its useful employment in practice. Highly technical instrumentations used in laboratory studies often are found to be inexpedient for use at the bedside. On the other hand when studies reach a point where the effects of the operation of several instruments are virtually alike in results, confusion and competition arise in our ranks to such a degree as to minimize its fundamental findings. Mention was made of the greater efficiency of sine waves in poliomyelitis. Was the frequency of 2000 cps a matter of convenience or arrived at from experience of frequencies of a higher magnitude? It would be interesting to know to what degree has the current in question a therapeutic value and to what extent has it been or is now employed in poliomyelitis and peripheral paresis? Even though one realizes the limitations of statistics based on mathematical prediction it has often rendered service in medicine and has served our profession with inspiring loyalty.

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### FRANK DUTCH HOWITT

August 24, 1894 — May 15, 1954

Dr. Frank Howitt, C.V.O., the well known British physician died on May 15 at the age of 59. In 1928, when only 34 years old, he was one of the doctors invited to attend King George V during his illness. Much of his most valuable work was done for the Army from 1940 to 1945. His experience in rehabilitation work was put at the disposal of the Minister of Labour to whom he served as honorary adviser. Dr. Howitt's death is a great loss to physical medicine and rehabilitation. His presence and influence will be missed by everyone who knew him.



# Rehabilitation of the Hemiplegic Patient: A Clinical Evaluation

Florence I. Mahoney, M.D., F.A.C.P.  
and  
Dorothea W. Barthel, B.A., A.R.P.T.  
Memphis, Tenn.

Few hemiplegic patients need be a burden to their families. Even when there is little or no return of motor function in either the upper or lower extremity of the involved side, most hemiplegic patients can be taught to be safe and independent in the following self care activities: (1) safe ambulation around the house; (2) getting in and out of bed and changing positions in bed; (3) self-feeding and dressing; (4) getting in and out of chairs and cars; (5) going to the toilet, attending to personal toilet, and (6) going up and down stairs using a hand rail. With slight assistance a patient can usually get in and out of a bath tub and with no assistance he can take a shower sitting on a stool. These activities can be relearned provided the patient can be motivated to work at becoming independent and the family and/or ward personnel discourage dependence. This goal is more easily accomplished when treatment begins early and the patient is not permitted to enjoy being an invalid. Such complications as prolonged mental confusion, marked incoordination, poor balance, poor circulatory response to exercise, and marked dependency needs of the patient or the family will limit the final results of rehabilitation and prolong the necessary treatment to attainment of independence. Many patients have considerable or total return of motor function and can even be expected to go back to work if the job is not too strenuous.

Recently reviewed were the results of physical medicine rehabilitation (hereinafter referred to as PMR) treatment on patients with hemiplegia due to cerebrovascular accident, who were treated at a large GM&S VA Hospital with paraplegia center from January 1952 to January 1953. All hemiplegics

housed on the Medical and Neurosurgical Services are referred for PMR treatment as soon as they are admitted and "worked up," except for patients so medically unstable as to make it dangerous to begin exercise. Although the treatment for all hemiplegics is administered in the same manner, only those cases due to cerebral vascular accident are reported in this study, since a number of head injury cases are treated elsewhere for many months before being transferred to our hospital. Early treatment is preferred even though the patient is unconscious or in poor contact, since it is important to prevent contractures and to stimulate interest and desire for independence again. This study, therefore, does not represent a select group of patients who came to the hospital for rehabilitation. In fact, most of them came for medical care and did not know PMR existed until their treatment was begun. In more than half of these patients it was possible to begin physical therapy within two weeks after the onset of the stroke. In those who were unconscious or in very little contact, treatment consisted of proper positioning and passive exercise to the involved extremities to prevent contractures. As soon as the patient was able to follow simple directions, an attempt was made to teach re-education and coordination exercises and early self care in the bed. All treatment was limited to the tolerance of the patient and was gradually increased as his span of attention and tolerance to exercise increased. There appears to be no danger in stimulating the patient to capacity when this rule is followed.

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From the Physical Medicine Rehabilitation Service, VA Medical Teaching Group Hospital, Memphis, Tenn.

Treatment was given on the ward by a physical therapist until the patient could tolerate sitting in a wheelchair for about two hours. With the ward physician's approval he was transferred to the clinic for more strenuous exercise and for addition of other therapies to his schedule. During the time he was treated on the ward he began to learn sitting balance, dressing activities, how to get in and out of bed to a chair and attempted ambulation with assistance. If the patient were aphasic or had any speech difficulty in the early stages speech therapy was initiated on the ward also. When the patient was able to tolerate clinic treatment he worked for more endurance, further self care and better ambulation. Coordination exercises, muscle re-education and strengthening exercises were given as needed. Occupational therapy was begun at this time. This was especially helpful when directed toward improving the function of the involved upper extremity when there was some return of muscle function, and toward training in the finer coordinations of the fingers. It is also helpful in those patients who have to change their handedness because of a right hemiplegia.

Speech therapy was carried on in a group as well as individually when the patient was treated off the ward. The speech therapist in our hospital is a former teacher who has interested himself in this work. Wepman<sup>8</sup> states that it is not necessary to have a speech correctionist, and this was found to be true. Stimulation<sup>9</sup> in language, arithmetic and writing is carried on by the same educational therapist.

As soon as the patient can tolerate it, corrective therapy is added to his program, and further conditioning and coordination exercises and more training in self care and ambulation are given. It is not possible with our staff and patient load to treat the patient more than three hours a day at his maximum tolerance, using all sections of PMR.

It is our experience that bracing should be kept at a minimum. Quadri-

ceps weakness or paralysis may not require bracing if the patient can learn to balance his body weight on each step. A drop foot brace is not prescribed unless the toe slaps as the patient walks, or his foot tends to evert. It is felt the weight as well as the added trouble of putting on the brace increases the disability unless it is absolutely necessary for safe ambulation.

All personnel working with the patient and his family try to teach them to understand and cope with the frustrations of his disability. In hemiplegia this includes not only the usual frustrations of chronic disability, but reduced intellectual efficiency and in the aphasics the reduced capacity for communication<sup>1</sup>. As a patient learns to do any new activity, or speak a new word or phrase, all who work with him must stimulate him to repeat these activities until he does them easily and naturally. As the patient gains ability to handle himself alone and, if he is aphasic, to speak more coherently, his emotional threshold rises and he ceases to cry or react with temper at things he cannot do. All of this often entails teaching ward personnel, since there is an ever changing group of attendants and nurses and a constant rotation of residents to the various sections of medicine and surgery.

In a study of 122 patients, PMR treatment was begun less than two weeks after the onset of the stroke in over half of the patients (sixty per cent). Most of our patients fell in the older age group; more of the patients were colored than white (table 1). All were males.

Table 1

"A" GROUP: 73 patients (60%) Treatment in PMR began not more than 14 days after stroke			"B" GROUP: 49 patients (40%) Treatment in PMR began 15 days to 4 months after stroke		
No. Patients	Per- centage	Age	No. Patients	Per- centage	
1	1.3	80-89	0		
2	2.7	70-79	3	6	
24	33	60-69	16	32.6	
43	59	50-59	23	47	
1	1.3	40-49	4	8	
2	2.7	30-39	3	6	
73 patients			49 patients		
			Color		
49	67	White	29	59	
24	33	Negro	20	41	

About the same number had right and left sided paralysis, and little difference was found in the length of time it took to rehabilitate patients in these two groups. Six per cent of the right sided patients were aphasic. Patients in the "A" group (those whose treatment began within two weeks after the stroke) were discharged at a faster rate and with a somewhat higher percentage of patients attaining independent self care and ambulation (table 2).

In general it took longer to achieve independence in self care and ambulation with the patients in the "B" group. It was interesting to note that sixty per cent of our patients (excluding those who died and those who remained mentally deteriorated) either had functional or near functional upper extremities with fifty per cent or better muscle power; with a grip of sixty per cent or better, or at least improved to this level during treatment. There were 23.8 per cent of the patients studied who showed significant improvement in the grip, though it was below sixty per cent at discharge. Twenty-eight patients in this series did not attain independent self

care and ambulation. The complications in achieving independence were as outlined in table 3.

Table 3

Complications	No. Pts.	Length of time treated
Bilateral A-K amputations before stroke	1	4 months
Painful calcification of gluteus medius	1	96 days
Would not stay for treatment	3	3 weeks-2 months
Completely aphasic	1	2 months-23 days
Poor balance	3	7 weeks-6 months
Marked mental deterioration	11	2 months to over a year
Deaths	4	

Twenty-eight patients did not attain independent self care and ambulation.

Seven patients were treated for their second stroke; all were discharged within two months, four with independent self care and ambulation. Only one patient in the group studied suffered a second stroke while being treated for the first.

### Summary and Conclusions

One hundred twenty-two patients suffering from cerebral vascular accident with hemiplegia from January 1952, through January 1953, were treated with PMR procedures. The results of this treatment have been reviewed.

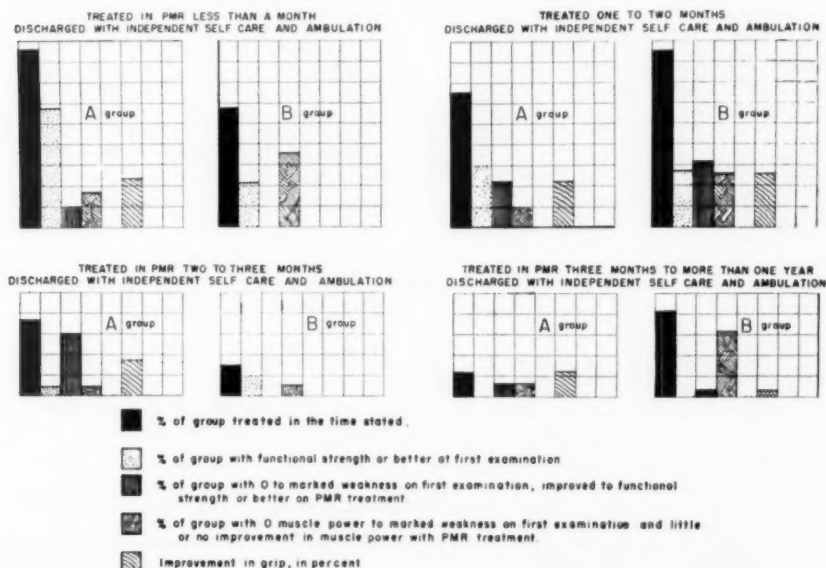


Table 2

A majority of these patients (81 per cent) were able to get along independently at discharge. Four patients died. Seven patients were treated for the second episode and four of these were discharged with independent self care and ambulation.

In general, those patients whose rehabilitation began within two weeks after the onset of the stroke made better and faster recovery than those whose treatment was started at a later date.

While under treatment, a significant number of patients improved in muscle function of the upper extremity and in power of the grip.

### Discussion

Lt. Col. Raoul C. Psaki (San Francisco): This presentation reaffirms the need for early rehabilitation both socially and economically if such realistic goals are to be reached.

We all recognize the two fundamental goals: one to be secure, and the other to be adequate. The wish for security may be considered as an expression of dependence, while the wish for adequacy may be interpreted as an expression of independence. In hemiplegia, whenever a goal is blocked or thwarted, the interplay between security and adequacy is upset. This usually results in frustration, insecurity, inadequacy, hostility and anxiety. The production of these psychological factors seriously interferes with the physical rehabilitation of the patient.

The authors have adequately evaluated the total problem and recognized the importance of these goals when referring to the inter-relationship between dependency and independency that are at work in the hospital and the home. These forces must be brought into balance through motivation. This is a complex problem and cannot be solved by a system of rewards and punishments, because motivation is a drive for security. It is within and is related directly to the individual's perception or attitudes to a situation. This compounds the complexity of the problem because each patient has had different experiences which play a role in his interpretation of a situation.

The positive motivation technics were undoubtedly utilized because eighty-one per cent of the patients discharged were able to get along independently according to the criteria presented.

The authors should be congratulated on their fine presentation.

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### GOING TO THE CONGRESS MEETING?

If you are, and plan to secure accommodations at the headquarters hotel for this period, may we suggest that you make your hotel reservation as soon as possible. Please direct your request to Mr. Victor Bushman, Front Office Manager, Hotel Statler, Washington 13, D.C. The following information should accompany your reservation request: date and hour of arrival; date of departure, and the type of room/s desired. It is important to state that your reservation is in connection with the annual Congress meeting. To avoid any possible disappointment, please ask the hotel to send you confirmation of your reservation. REQUESTS FOR RESERVATIONS MADE AFTER AUGUST 23 CANNOT BE ACCEPTED.

## The Use and Abuse of Braces in Rehabilitation of Neuromuscular Disorders

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Practical experience indicates that it is almost impossible to rehabilitate a patient having more than slight residuals of neuromuscular disorders without some degree of bracing. Neuromuscular dysfunctions occur in all age groups and complicate a large number of disease entities. It is then obvious that the majority of physicians, at one time or other, will have to prescribe braces for such conditions. Successful bracing of disabilities, like any other form of treatment, is dependent on the knowledge and clinical judgment of the physician in selecting the proper appliance to provide the desired effect.

The bracing of a disabled body segment is not a mechanical but a physiological problem and necessitates an understanding of the operation of the segment as a functional unit. If such a disabled unit is provided with a wrong, badly fitted, or malaligned brace, it may aggravate the disability producing severe permanent damage. Too often a brace is prescribed without the knowledge of its possibilities and limitations. Many times the test of its efficiency is made on appearance only, just as the aeroplane splint was used without the appreciation of the imperfect control and the resulting rotation deformity of the scapula. Frequently braces are permitted to be worn for far too long a time.

Braces designed to facilitate locomotion are usually subdivided into (1) weight bearing braces, which eliminate entirely all stress on an extremity, and (2) functional braces, which usually are employed for disabilities caused by neuromuscular dysfunctions. Here, it is necessary to distinguish two types of disabilities that require bracing. The first type includes those conditions that have normal muscle power but show

abnormal movements, as in cerebral palsy. Bracing of these is quite a different problem from bracing of disabilities showing weak or paralyzed muscles which may or may not be associated with abnormal movements. Yet, quite often, one sees light braces used in a vain attempt to control the strong and vigorous movements of a spastic child. The second type includes disabilities showing weak or paralyzed muscles; these represent the largest group requiring bracing. Braces for this group should provide efficient and active help in restoring the functional activity of the individual to as near normal as possible. These functional braces should not support the body weight directly, but should restore the postural alignment of the body and establish balance between the physical forces acting on the joints braced. These braces should provide the optimal position for function and physiological rest to the muscles<sup>1</sup>.

Intelligent bracing of neuromuscular dysfunction depends on the scientific evaluation of the extent of muscle disability. This evaluation is the most important single criterion for determining the type and extent of bracing that will be necessary. The disability of a muscle or muscle group is measured by the degree of deficiency in its ability to perform full work. The work of a muscle is not only its ability to move a joint but its ability to perform the normal functional movement of the bodily segment with normal excursion, strength, speed, coordination, and endurance. In practical terms, this work essentially is the ability of the muscle or muscle group

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to lift and propel a given body segment and to stabilize the appropriate joints. An evaluation of work ability is made only after repeated analysis of muscle function. It is not enough to see a patient walk a few steps with more or less difficult gait. This alone does not measure the degree of his weakness any more than it is possible to evaluate an individual's physical capacity by asking him to perform a few simple movements of the right arm in different planes. The analysis of muscle function is primarily based on a voluntary muscle test, but this test forms only a part of the general evaluation. The manual voluntary muscle test often does not show the actual potential functional ability of the muscles because it is performed in positions which are not assumed habitually by the tested muscle. The best example of this is the quadriceps muscle of a hemiplegic patient, which may show less than fifty per cent muscle power when the subject is lying down, but is capable of performing a full range of motion when the extremity is dependent. Therefore, it is essential to evaluate the muscle power against normal average activity in the habitual functional position. Other important factors to be considered are the weight of the extremity to be braced, its length, the arc of movement present, the reaction time of muscular response to stimuli and the action of synergic and antagonistic muscles. In addition, the age, type of lesion, and weight of the patient have to be considered.

The apparatus for neuromuscular disorders is designed in such a way that it will supplement the remaining function of muscles. It should not be more extensive than the disability requires. This means that in braces for lower extremities the strength or size of the upright bars should be sufficient to receive the stress and torque of the body during weight bearing and locomotion. The brace, however, should not and must not be too heavy; it must be remembered that the patient with neuromuscular disorders has to ambulate and function with muscles that are weak. The weight of

the brace adds greatly to the dead load of the limb. This is not a simple addition but, because of the lever system, a tremendous multiplication of the load occurs at the peripheries.

In selecting the apparatus, its efficiency should be considered, as well as the length of time it will be worn by the patient. If the brace is to be used only for a short time, then often it can be made lighter. The degree of disability and the rate of return of function will largely govern this selection. An efficient brace is usually one that is economical to maintain. As with other mechanical devices, braces require a certain amount of servicing and repairs. As a general rule, a brace should be selected with the most simple design that will accomplish the purpose and mission. Such a brace will usually prove to be the most economical.

The most important parts of any lower extremity brace are its hinges, and these should be chosen individually and aligned accurately. The best placed ankle hinge is the stirrup type. The caliper hinge should never be used routinely for neuromuscular disorders, since it places the axis of motion in an unphysiological position at the heel. Even in a severely spastic patient, who may be unable to put on his shoes with braces attached, a detachable stirrup ankle hinge can be used successfully.

A free motion ankle hinge is used to stabilize the ankle joint or when bracing is necessary for knee or hip joints. When there is muscle weakness or imbalance around the ankle resulting in a drop foot, a limited motion hinge is necessary. For correction of neuromuscular disabilities, only the positive dorsiflexion spring operated ankle joint—such as the Klenzak-Pope type—should be used because it maintains the foot in dorsiflexion when at rest and at non-weight bearing position. This prevents stretching of the weak dorsiflexor muscles and provides better clearance of the foot during ambulation, thus permitting a smoother gait. This type of hinge is easily adjusted for the required motion.



It is sturdy and economical in upkeep. The use of other types of limited motion ankle joints in the treatment of neuromuscular disabilities is becoming archaic, like the peg-leg, principally because of the persistent undesirable position of plantar flexion that they maintain.

Until quite recently, there were only two general types of hinges available for knee and hip joints, namely free and locked. A free single or double joint is used when the muscle strength is sufficient to perform a functional range of motion and is able to stabilize the extremity adequately for a short time but insufficiently for functional locomotion. It is also used to minimize or eliminate certain undesirable movements caused by muscle imbalance. If, however, the muscle strength is so poor that active functional range cannot be performed, locked hinges have to be used.

Between these two extremes there is a large group of patients in whom the disability or progress in recovery is such that locked hinges are too restricting, yet these patients are unable to use free joints. It is in this group of patients that offset hinges have been successfully used. The basic principle of an offset hinge is to have its axis on one side of the load line and the weight force on the other. This arrangement will permit stabilization of the joint on weight bearing, yet preserve free range of motion. Stabilization is secured by a stop on each hinge, which controls the amount of hyperextension. This stop can be adjusted to meet the needs of the individual. We have found that it is not necessary to provide more than five degrees of hyperextension; usually two to three degrees will suffice. These offset hinges are a Thayer VA Hospital brace shop modification (fig. 1) of the ones introduced two years ago by Cmdr. Thomas J. Canty of the U. S. Naval Hospital, Oakland, California. Canty used these hinges only at the knee joints. They have also been used successfully at the hip joint in monoplegias, hemiplegias, and paraplegias caused by such diseases as poliomyelitis, cardiovascular

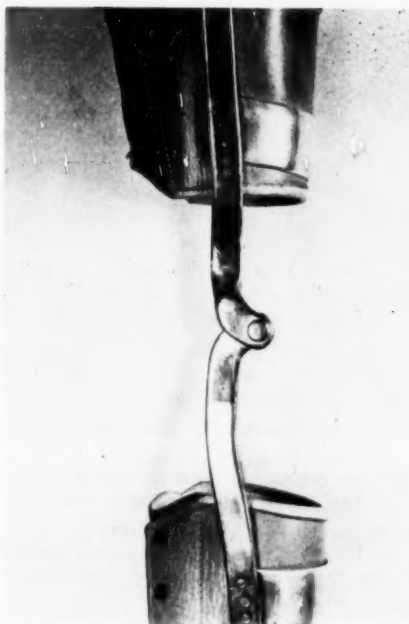


Fig. 1 — Offset knee hinge.

accidents, and cord injuries. It is obvious that any locking of the artificial joint at the hip, especially if it has to be combined with a locked knee joint, restricts locomotion to such an extent that it becomes impractical. Ordinarily, most of these patients either are not braced at the hip or are given free hinges. On locomotion, they have to hyperextend in the hip joints and lumbar spine to obtain stabilization. The result is an excessive lordosis and severe strain and stress on the anterior pelvi-femoral ligaments of the hip, both producing grave complications. The patient, who usually walks with crutches, has an abnormal posture. When, however, the offset joints are used, the degree of hyperextension is easily controlled, the stress and strain is removed from the hip ligaments, excessive lordosis is prevented, and the abnormal posture is corrected or minimized. The patient has a good sense of stability and walks with greater freedom. These advantages of offset hinges result in a much quicker return of muscle strength, optimal mo-

tion, and functional use of the extremities. The net outcome is a speedier rehabilitation of the patient. If braces are required for an indefinite period, the offset joints should be used whenever possible because they permit the patient much greater activity with better stability. It is obvious that offset hinge braces can be used only in conditions having flaccid paralysis. Patients showing spastic paralysis are unable to utilize these hinges effectively.

In selecting a locked knee hinge, it is necessary to consider not only the degree of local involvement but also the amount of total disability. If the disability is confined to lower extremities, then ring locks can be used. These are simple, not too expensive, and give good service. At times, however, they may be hard to operate, especially through clothing. In such cases, various spring locks are available. Again, the simplest device selected for the given disability will prove to be the most economical. In the adult patient, locks must be provided on both hinges, otherwise, a torsion of the brace occurs with malalignment. In cases where upper extremities are disabled or the patient requires them for crutches, etc., then a bail lock should be used. There are several types of these on the

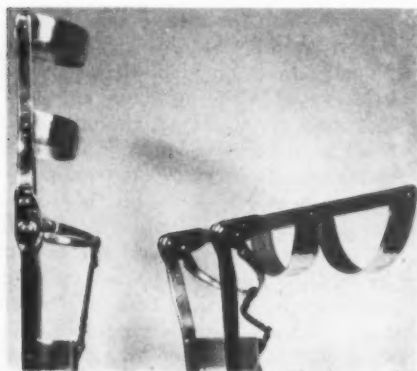


Fig. 2 — Bail lock designed by W. Slodek, Orthopedic Brace Shop, Thayer VA Hospital, Nashville, Tenn.

market. The one illustrated was designed by Slodek (fig. 2). With these bail locks, the patient has free use of the hands at all times and can trip the locking mech-

anism on the edge of a chair while sitting down. The joint becomes locked in extension on standing.

Oftentimes, especially during the early phase of rehabilitation, it may be necessary to attach the long-leg braces to a pelvic band or a trunk brace. Such an arrangement creates an insurmountable obstacle for an average disabled patient, who then requires help of others to put on such a brace. To overcome this disadvantage, a detachable rectangular retention joint on the pelvic band or bar has been successfully employed. This joint, designed by Taylor, permits easy disengagement of the pelvic bar or band



Fig. 3 — Detachable rectangular retention joint for use with pelvic band or trunk brace. Designed by M. T. Taylor, Orthopedic Brace Shop, Thayer VA Hospital, Nashville, Tenn.

from the upright bar of the long-leg brace (fig. 3). The patient can put on separately his long-leg braces and the rectangular retention joint of the pelvic band or trunk brace is slipped on the uprights. The joint also allows the physician to evaluate the functional muscular strength and balance more thoroughly and to compare the advantage and dis-

advantage of the trochanteric joint, as well as the necessity for its further use, because it is easy to have the patient walk with or without this joint functioning. Another advantage of this retention joint is that the patient may be permitted to use the braces without the trochanteric joint for certain periods of time and, in this way, gradually build up the strength and coordination of the weak muscles.

The question of bracing or splinting of neuromuscular disorders of the upper extremities is extremely complicated. It should be pointed out that only a few basic principles should be considered when selecting such an apparatus. At first, it must be realized that there is a fundamental difference between the problems of lower and upper extremity bracing. The former is principally concerned with stability during locomotion, while the latter emphasizes mobility during function. In neuromuscular disorders of the upper extremities, rigid splints should be used rarely and with the utmost caution and only when all the joints can be exercised several times daily. If this is not done, then there is a risk of developing stiffness, especially in the joints of the fingers and thumbs, which outweighs the harm due to stretching of paralyzed muscles. In general, splinting of the hand and forearm should restore muscle balance and the position of function to the hand. The splint should hold the wrist in dorsiflexion, the metacarpophalangeal joints in flexion, the metacarpal arch curved and the thumb in opposition; it should exactly counterbalance the action of the antagonist muscles and no more. If this imbalance is corrected properly, the hand will be able to assume the position of function and can be used effectively. This is accomplished by incorporating elastics or springs into the splint which substitute for and are equal in degree to loss in motor power (fig. 4). A splint should never hinder the action of the non-paralyzed or antagonistic muscles.

There are numerous splints available for different types of disabilities. It is, however, the responsibility of the physi-



Fig. 4 — Functional splint properly correcting existing disabilities. Note the use of a Hunter Spring to facilitate extension of the terminal phalanx of the thumb. This Hunter Spring, which was introduced by Miss Rose Elliott, O.T.R., is more adaptable than elastic. Hunter Springs exert an even pull at any length. (Courtesy Miss Rose Elliott, Chief, O.T. Department, Gonzales Warm Springs Foundation, Gonzales, Texas).

cian to select the proper one for each individual case. This means the physician should be thoroughly familiar with the appliance and know its possibilities and limitations much more so than is needed in bracing of the lower extremities. Oftentimes, a selected appliance may correct one disability but, at the same time, cause harmful muscle imbalance in another area. This should never be permitted. In weakness or paralysis of the shoulder girdle, it is necessary to protect the involved muscles from overstretching. The brace should be so constructed that it will eliminate the influence of the weight of the extremity, derotate the scapula, and preserve the maximal mobility of the shoulder joint.

#### Conclusion and Summary

It is apparent that this presentation has touched but lightly on a few of the problems of bracing in residuals of neuromuscular disorders; the main aim was to bring into focus the crying need for the use of more scientific methods in the selection and prescription of the ap-

paratus. Braces and appliances are still abused in a good many cases. This unfortunate situation is the result of a lack of comprehensive knowledge of the various factors involved in the selection of a brace by physicians who refer patients to brace makers with words, "Go and get yourself a leg brace." Yet these same physicians would not think of sending a patient to a pharmacist with words, "Go and get yourself some drug for your blood pressure." A brace should be considered nothing else but a medicine applied externally, and should merit the same careful prescription, which should specifically state the type of brace and what it should accomplish. Some of the factors concerned in prescribing braces and appliances were discussed, with emphasis placed on the proper evaluation of the disability and proper selection of the apparatus.

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#### Discussion

Dr. Jessie Wright (Pittsburgh): The author has outlined points of critical importance in planning braces. He has made clear the different requirements for protecting weak muscles in appliances to favor functional activity. The role of the hand as the instrument of the arm is emphasized, as well as the necessity of adapting elbow and shoulder parts of a support to favor hand function.

The bracing problems in the lower extremity are different since stability and locomotion are basic needs. The offset joint is certainly a useful one to give security and at the same time improve position and function. Bracing for overactive extremities, such as found in spastic paralysis, must be more substantial.

Dr. von Werssowetz's paper is not only informative, but shows that he has an exceptional understanding of the essentials involved.

### 32nd Annual Session

#### SCIENTIFIC EXHIBIT SPACE

Requests for applications for scientific exhibit space in connection with the 32nd Annual Session to be held at Hotel Statler, Washington, D. C., September 6-11, 1954, are being received. Address all communications to the American Congress of Physical Medicine and Rehabilitation, 30 North Michigan Ave., Chicago 2, Ill.

# Ruptured Diaphragm: Late Cause of Death in Paraplegia

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## Introduction

Specialists in Physical Medicine and Rehabilitation are called upon to be responsible for the care of patients who have suffered paraplegia of traumatic origin. This is particularly true in the later stages of rehabilitation, months or years after the injury. The present case is reported because it illustrates an important, and in this case fatal, complication of a crushing injury ten months later when referred for rehabilitation procedures. The Physiatrist should be cognizant of the possibility of traumatic diaphragmatic rupture causing symptoms for the first time many months after injury and which may be rapidly fatal when evisceration into the thoracic cavity occurs.

## Case Report

A thirty-two year old former miner, a paraplegic, was admitted to the hospital for rehabilitation. Ten months previously, while at work, he was crushed by a fall of rock on the small of his back. He did not lose consciousness, but had immediate paralysis of both legs and numbness. He was carried to the elevator shaft face up and taken to the hospital. Treatment there included constant catheter drainage, enemas as needed, and passive exercises to the extremities. Five months after injury, because of persistent pain in the back, a laminectomy was performed. One month later he had some cramping pains and "pins and needles" sensations in both legs, but never had return of normal sensation. Two months before admission here, the catheter was removed and he voided spontaneously. He was sent home at that time. Two weeks before entry he had pain in the region of the left kidney and passed bloody urine. He had had no

other episodes of hematuria.

The past history was negative except for malaria in the Philippines seven years before admission.

Physical examination on admission showed a well developed man in no distress, with normal temperature, pulse and respirations. The heart, lungs, and abdomen were normal. There was a large decubitus ulcer over the sacral area and an operational scar in the dorsolumbar area in the midline of the back without tenderness. There was complete paralysis of both lower extremities except for hip flexion of twenty degrees. Anesthesia was complete below the inguinal region on the left and in the mid-thigh on the right.

Laboratory studies showed the urine to be loaded with white cells and to contain twenty-five red cells and a few bacteria per high-power field. Examination of the blood revealed a hemoglobin of 15.00 gm. per 100 cc. and a white-cell count of 14,100, with 69 per cent mature and 1 per cent young neutrophils, 1 per cent unclassified cells, 22 per cent lymphocytes, 4 per cent monocytes and 3 per cent eosinophils. The serum total protein was 7.25 gm.; the albumin 4.61 gm.; the globulin 2.44 gm., and the non-protein nitrogen 47 mg. per 100 cc. A roentgenogram of the chest was normal. X-ray study of the thoracic and lumbar spine showed a severe old compression fracture of the body of the first lumbar vertebra, with marked narrowing of the twelfth thoracic intervertebral-disk space; the body of the first lumbar vertebra

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was displaced very slightly anteriorly in relation to the twelfth thoracic vertebra. Considerable bony overgrowth had occurred about the fracture between the twelfth thoracic and the first lumbar vertebrae. There was irregularity of the transverse processes of the first and second lumbar vertebrae that was probably due to injury. There also appeared to have been an old laminectomy of the first and second lumbar vertebrae. Calculi were observed in the urinary bladder, but none in the ureters or kidneys.

On the second hospital day at about 1:00 P.M., he reached back of the bed to pull the light switch with his left hand and experienced sudden severe, steady, left subcostal pain. This was not influenced by respirations. He vomited once without relief and retched repeatedly thereafter, without results. Examination of the heart and lungs was normal. There was no dyspnea or cyanosis. On palpation there was marked tenderness in the left upper quadrant near the midline and beneath the ribs. There was no muscle spasm and no palpable masses were found. There was no flank or costovertebral-angle tenderness, but slight pain on the left was felt on jarring. Peristalsis was almost absent, but the remainder of the abdomen was soft and non-tender. The temperature, pulse, respirations, and blood pressure continued to be normal. The pain subsided somewhat after atropine and 100 mg. of meperidine (Demerol), being felt only on turning from side to side.

The pain persisted at about the same level throughout the afternoon and night. By 9:00 A.M. the following morning, the patient became short of breath and slightly cyanotic without change in the character of pain, which was not made worse by breathing. He was alert, but the skin was cold, moist, and pale. The pulse was rapid and weakening, suggesting an impending circulatory collapse. The left side of the chest was hyper-resonant, with absent breath sounds, and the heart and trachea were deviated to the right side. Temperature was 98 F., the pulse 130, and the respirations 30.

An x-ray was taken and a thoracentesis needle was inserted just lateral to the left nipple, with withdrawal of several hundred cubic centimeters of air and 50 cc. of turbid-gray-brown fluid which had an acid reaction on testing. The patient died within a few minutes in spite of artificial respiration and intercardiac adrenalin.

At autopsy the left lung was found to be in collapse, due to a rent in the diaphragm through which had passed the left transverse colon, the splenic flexure, some omentum and a huge ballooned-out stomach lying up against the heart. The stomach was enormous, containing three liters of fluid; the only parts of the stomach that had not herniated through the rent was the cardiac orifice and the antrum. The rent was located about 3 cm. to the left of the esophageal orifice and extended laterally for 18 cm.; it was 5 cm. wide at its widest point. It was evidently an old rent, because the pleural and peritoneal surfaces were fused and well healed, so that the hole must have been present ever since the original accident. There were no adhesions, probably allowing for free herniation or evisceration. There was marked infection of the kidneys because of the paraplegia and stones in the urinary bladder.

An incidental finding was coarctation of the aorta, which was thought to be too high to be connected with his injury, and microscopically there was no evidence of old blood in the region.

### Discussion

There are several points to emphasize in this case. First, the trip by railroad and the attendant motion may have played a role in moving the contents of the abdominal cavity into the thorax. Secondly, as to symptomatology, the patient attempted to vomit and kept on retching, but the mechanism of vomiting was destroyed when evisceration into the pleural space occurred. The antral region of the stomach became obstructed and the stomach became enormously dilated and filled with swallowed air and fluid. It became impossible for the patient to empty his stomach by attempts to vomit, because of obvious mechanical



factors. It was of course also mechanically impossible to empty the stomach by means of a tube. In retrospect the only means of saving this patient's life would have been an early diagnosis and surgical repair of the diaphragmatic defect.

In conclusion it is emphasized that all physicians caring for patients with paraplegia from crushing injuries should be alert to the possibilities of an associated ruptured diaphragm, which may be a late and rapid cause of death.

## Effects of Nitrogen Mustard Therapy in Patients with Rheumatoid Arthritis

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For several years, we have been interested in establishing base line characteristics in rheumatoid arthritis in an attempt to evaluate various treatments and therapeutic agents. Previously, we have studied the alteration of plasma proteins in rheumatoid arthritis by the technic of electrophoresis<sup>1</sup>. The distribution of the plasma protein components varies with the activity of the disease and can be altered by a number of therapeutic agents<sup>2,3,4</sup>. Attempts have also been made to use the changes of synovial membrane permeability as a measure of the effectiveness of selected treatments, but the difference in membrane permeability did not parallel therapeutic response<sup>5</sup>. In an effort to increase our information we have extended our studies to include changes in calcium, phosphorus and nitrogen metabolism, 17-ketosteroid excretion, glucose tolerance and protein bound iodine levels.

The etiology of rheumatoid arthritis is unknown<sup>6</sup>. Many theories have been proposed. Among these are infections, endocrine disturbances, vascular changes, derangement of the nervous system, psychogenic factors, metabolic disturbances, and hypersensitivity reactions<sup>7-11</sup>. At present, there is increased interest in the hypersensitivity theory because the arthralgias of rheumatic fever, acute serum sickness, collagen vascular diseases and the joint involvement occurring in scarlet fever, often are difficult to differentiate

from acute rheumatoid arthritis. Nitrogen mustard inhibits a number of these hypersensitivity phenomena. Becker<sup>12</sup> first demonstrated that this agent suppresses local tissue reactivity. Other investigators have confirmed his work and have shown that mustard also inhibits antibody formation and blocks antigen-antibody combinations<sup>13,14</sup>. These findings suggested the use of nitrogen mustard in the treatment of rheumatoid arthritis. Diaz<sup>15</sup> was the first to describe the use of nitrogen mustard in patients with rheumatoid arthritis, but his report was incomplete and lacking in data. Phillips<sup>16</sup> found mustard to be highly effective and noted a prompt fall in serum gamma globulin concentration, whereas, Cohen<sup>17</sup> reported its failure to improve his patients. Administration of the drug to a few of our patients gave encouraging results. A study was therefore designed to follow clinical, chemical, and metabolic changes that occurred after the administration of nitrogen mustard.

Patients were selected who had severe active deforming rheumatoid arthritis of

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long duration. These patients were severely handicapped and in the past had tried many other forms of treatment.

After the initial examination, which included routine laboratory tests and roentgenograms, the extent of the joint disease and the functional capacity of the patient was classified according to the methods of Steinbrocker<sup>19</sup>. Because of the difficulty of comparing joint mobility in different individuals before and after treatment, it was necessary to devise a simple means of measurement. The range of motion of all the joints in the body from the jaw and neck to the small joints of the hands and feet was either measured with a goniometer or was estimated as a percentage of normal motion. As may be seen in table 1, the joint mobility is expressed either as a single figure, i.e. jaws 40; or a double

percent of error. The clinical response to therapy was also evaluated according to the method of Steinbrocker namely, 1) complete remission; 2) major improvement; 3) minor improvement, and 4) no benefit. This study included seventeen rheumatoid arthritic patients, ten of whom participated in detailed metabolic studies, while seven were observed clinically only.

This study was divided into four periods of two months each. The patients were admitted to a special metabolic ward for the first two weeks of each period. They were given a weighed diet containing 100 gms. of protein, supplemented by multiple vitamins and minerals. During each period of observation, glucose tolerances, plasma electrophoretic patterns, protein bound iodine levels, and bromsulfalein tests were carried out at least once. Complete blood counts, hemoglobin determinations, erythrocyte sedimentation rates and eosinophil counts were obtained weekly. Urinary creatinine and 17-ketosteroid excretion in the urine were determined daily, and urine and stools were collected each day for analysis of calcium, phosphorus and nitrogen. The clinical status of the patient was surveyed each day and the extent of joint motion was measured at frequent intervals.

During the first two weeks the subjects were encouraged to move about; were given as much physical therapy as time allowed and aspirin for pain. In this first period, the individuals were instructed concerning their disease, shown that they must live with some pain and advised not to expect miracle cures. Upon leaving the hospital they were instructed in exercises that could be carried out at home. At the end of six weeks they returned to the hospital for the second two-week period of observation. The series of tests were repeated in the same manner as in the first period. Physical therapy and aspirin were continued. Again, the patients were discharged for six weeks and then returned to the hospital for the third period of observation. At first the same battery of tests was performed and the patients

Table 1: Measurements of Joint Mobility in Normal Subjects

		Joint Mobility Degrees or % of Normal	Mobility Index
Jaws		40	4
Neck	flexion-extension	110	11
	rotation	140	14
Spine		60	6
Shoulders	abduction	90-90	18
	flexion	180-180	36
	extension	60-60	12
Elbows	flexion-extension	150-150	30
Wrists	flexion-extension	180-180	36
	pronation-supination	180-180	36
Hands fist		100-100	20
	oppose thumb to fingers	4-4	8
Hips	adduction	60-60	12
	abduction	45-45	9
	flexion	150-150	30
	extension	45-45	9
Knees	flexion-extension	150-150	30
Feet and ankles	total range	100-100	20
TOTAL			341

figure, i.e., shoulders 90-90. For convenience, the degrees and percentages of normal motion were each divided by ten and the values totaled. This gave a mobility index which in the normal subject ranged from 325 to about 360, and averaged around 341. The mobility index facilitated comparison of results of treatment in a series of patients. Repeated measurements on the same patient by different observers showed this method to be reproducible within a five

were examined carefully, particularly relative to joint mobility. Physical therapy was discontinued and aspirin reduced to minimal doses. A conventional dose of nitrogen mustard, 0.1 mg./kg. was given daily for four days. Experience has taught that the following method of administration reduces the incidence of nausea and vomiting.

Patients were told that vomiting might

occur as a natural response to this drug. A light supper was given on the night of treatment. At 1900 hours the patient received 100 mg. of pentobarbital (Nembutal) orally, followed by an injection of 50 mg. of meperidine (Demerol) one hour later. At 2100 hours an intravenous infusion of normal saline was started. Amobarbital sodium (Amytal Sodium) was injected into the tubing in an

### EFFECTS OF NITROGEN MUSTARD ON BLOOD VALUES

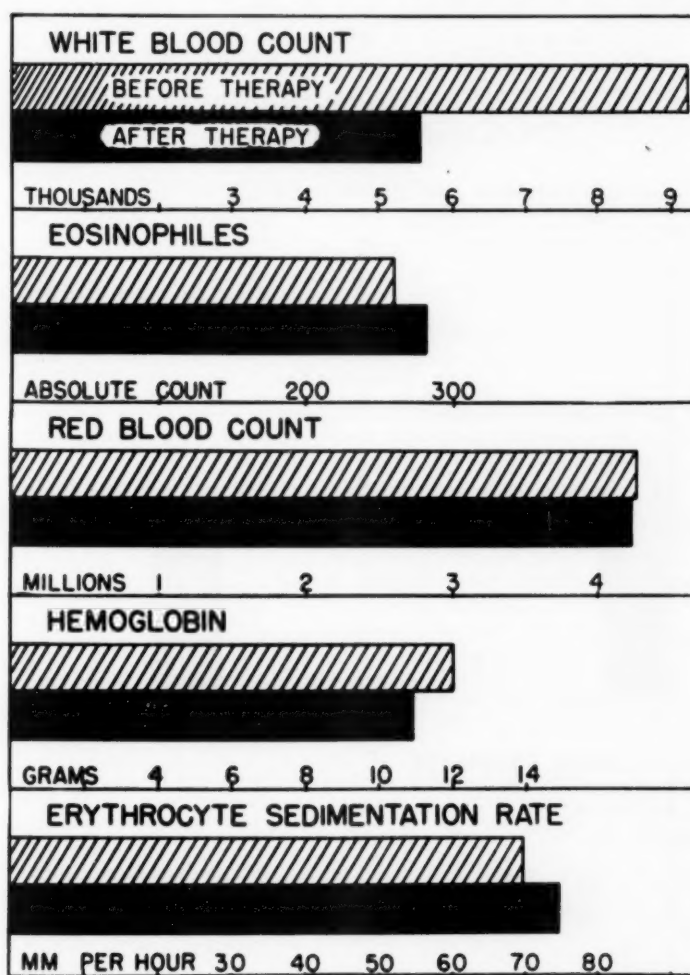


Fig. 1 — The familiar pattern of mild leukocytosis, mild hypochromic anemia and rapid sedimentation rate characterizes rheumatoid arthritis. Nitrogen mustard affects chiefly the white blood count.

amount just sufficient to produce sleep without obliteration of the gag or cough reflex (100 to 300 mg.). An ampule of nitrogen mustard was dissolved in saline and the appropriate amount injected into the tubing. The saline was continued for a few minutes to flush the vein and thus decrease the chances of thrombophlebitis. To prevent aspiration of vomitus, the patient was turned on his side, the pillow removed, and precautions taken to prevent his falling out of bed.

The remainder of the two-week period was devoted to observation of the clinical response. Strict attention was

paid to white blood count, the erythrocyte count and the hemoglobin level. The patients were sent home without further instruction. They were again admitted at the end of six weeks for the fourth period of observation. The usual tests were carried out and the patients' clinical response determined.

Of the seventeen patients, only six experienced actual vomiting, while the remainder complained of slight to moderate nausea or anorexia. None developed prolonged vomiting or dehydration. In most instances the appetite returned to normal twenty-four hours after the last dose of mustard.

### EFFECTS OF NITROGEN MUSTARD THERAPY ON ADRENAL FUNCTION

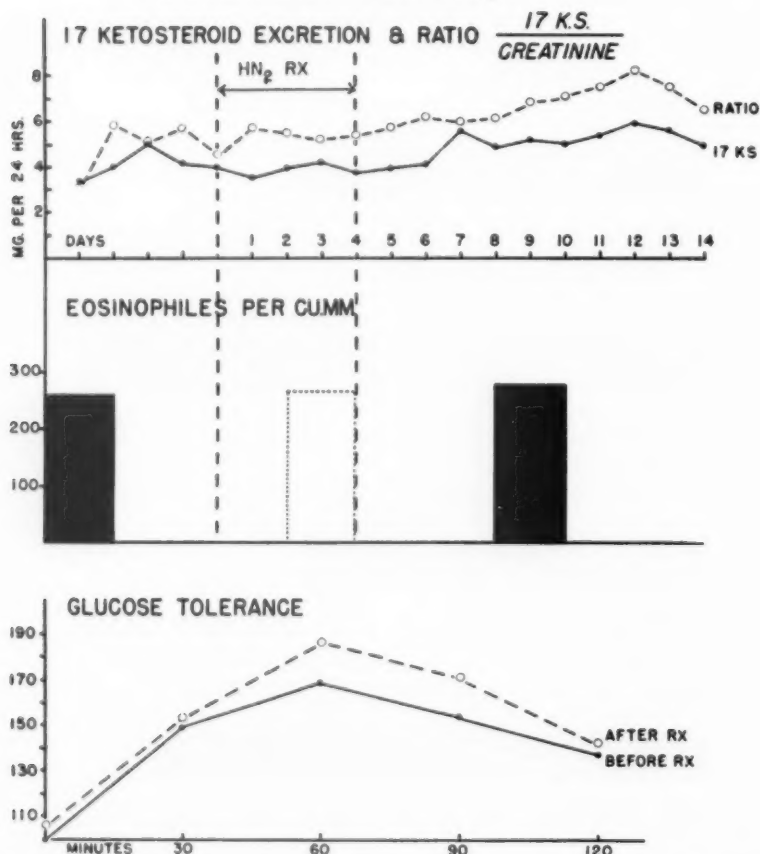


Fig. 2 — Average values for 17-ketosteroid excretion, eosinophil blood counts, and glucose tolerance do not indicate adrenal stimulation.

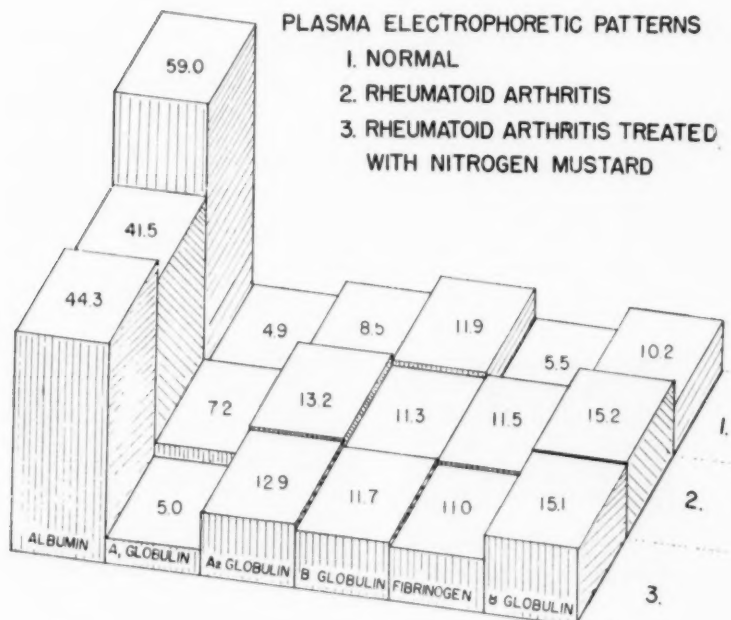


Fig. 3 — Plasma electrophoretic abnormalities: In rheumatoid arthritis, albumin is decreased while alpha<sub>1</sub>, alpha<sub>2</sub>, and gamma globulins are increased. Fibrinogen elevation corresponds with erythrocyte sedimentation rate.

In the majority of patients, subjective improvement in joint pain began after the second dose of mustard. This was clearly demonstrated in a decrease in the frequency of requests for aspirin. In two patients whose arthritis was accompanied by marked edema of the lower extremities and severe joint effusions, treatment with nitrogen mustard resulted in a prompt diuresis. This was followed by disappearance of the edema and marked reduction of joint effusions. All but one of the patients showed an increase in joint mobility after treatment. It is interesting to note that fourteen of the patients stated that this treatment was worthwhile, and to date five have requested additional courses of nitrogen mustard.

Laboratory studies disclosed the familiar pattern of mild hypochromic anemia, moderate leukocytosis, and rapid erythrocyte sedimentation rate. Slight decreases in the erythrocyte counts and hemoglobin levels were observed after nitrogen mustard. The white count de-

creased reaching its lowest level about a week after completion of treatment, and then slowly returned to normal. The sedimentation rate was unchanged (fig. 1).

The urinary excretion of 17-ketosteroids and the ratio of 17-ketosteroids to creatinine were normal and were not changed by treatment (fig. 2). The eosinophil counts remained unchanged despite the temporary leukopenia, so that a relative eosinophilia existed for a few days. The glucose tolerance curves showed a slight impairment of carbohydrate utilization and this was unchanged after treatment. This abnormality in carbohydrate utilization was described as early as 1925 by Pemberton<sup>10</sup>. The bromsulfalein test of liver function and the protein bound iodine of the plasma were normal before and after therapy.

Electrophoretic analysis of the plasma proteins revealed abnormalities characteristic of rheumatoid arthritis. Following treatment with nitrogen mustard the

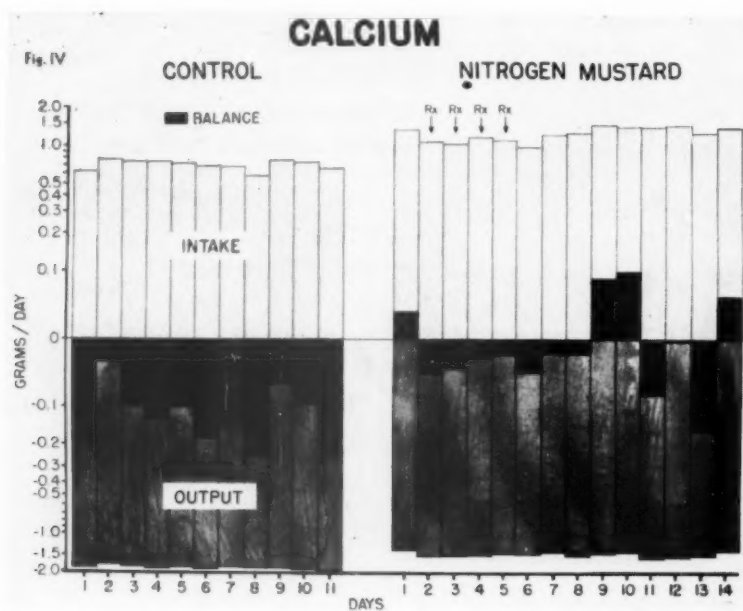


Fig. 4.

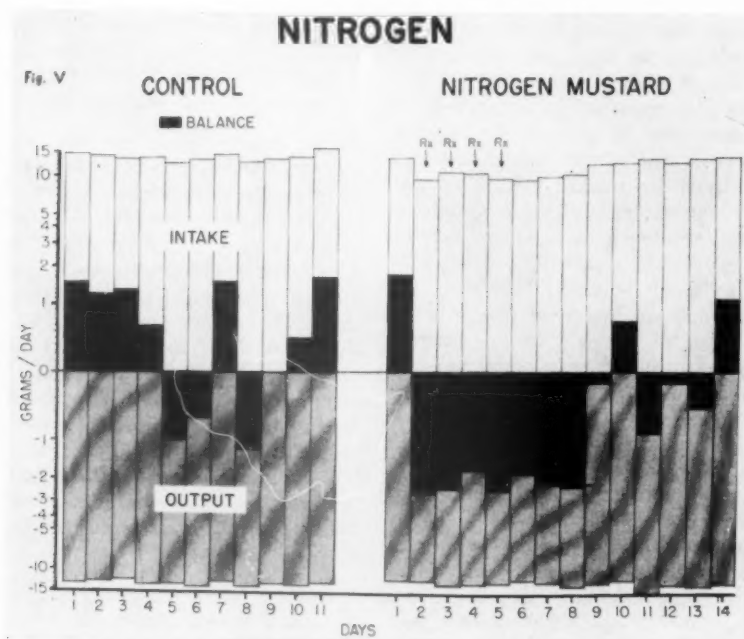


Fig. 5.



various fractions tended to shift towards the normal (fig. 3).

Calcium balances were uniformly negative during the control period even though the subjects were eating an adequate diet. During and after treatment there was marked improvement in calcium balance (fig. 4). In spite of the consumption of 100 gms. of protein a day during the control period, the patients were in a precarious nitrogen and phosphorus balance (fig. 5 and 6). During therapy, heavy losses of nitrogen and phosphorus occurred, due in part to decreased intake. This was followed by a return to the pre-treatment levels.

Most of the patients included in this series had severe arthritis as evidenced by the fact that they were designated type III or IV according to Steinbrocker's system of classification<sup>6</sup>. The classification of four patients improved after treatment. The response of the rheumatoid activity to therapy (Steinbrocker's) averaged grade II to III (major to minor improvement) (table 2).

Joint mobility studies clearly indicated the remarkable degree of improvement that was obtained by the combined use of aspirin, physical therapy and close patient contact<sup>20</sup>. After four months of this type of treatment, improvement had reached near maximum. Nitrogen mustard therapy, even though it was administered at this stage of improvement, produced an increase in joint mobility (fig. 7). The improvement in joint mobility was fairly well maintained for a twelve-week period.

### Summary

Seventeen patients with severe active rheumatoid arthritis were studied before and after treatment with nitrogen mustard.

After therapy, sixteen patients showed considerable improvement, averaging from minor (grade III) to major (grade II). The duration of improvement averaged twelve weeks.

The abnormalities found in rheumatoid arthritis are hypochromic anemia, mild leukocytosis, rapid erythrocyte sedi-

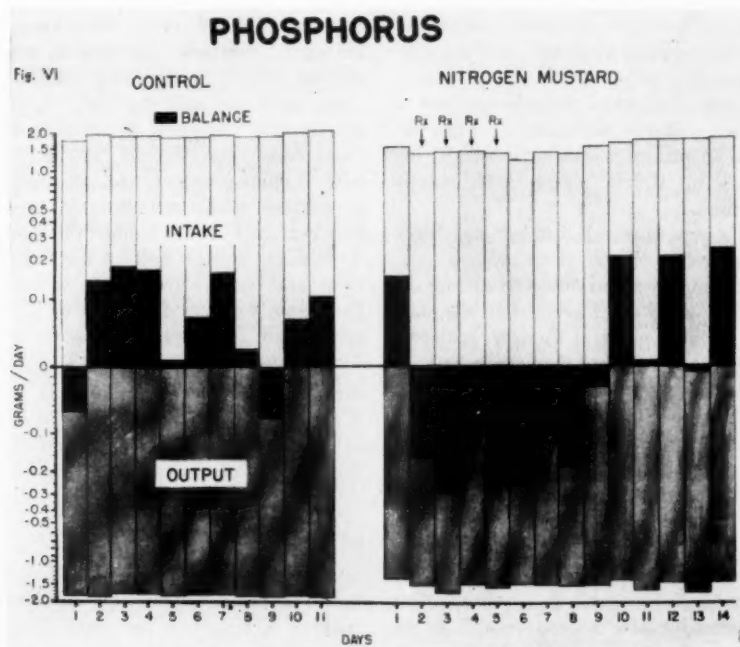


Fig. 6.

Table 2

Patient	Age	Before Treatment			After Treatment			Result of Rx	Duration of Benefit
		Stage of Arthritis	Functional Class	Joint Mobility	Stage of Arthritis	Functional Class	Joint Mobility		
C. R.	51	III	III	174	III	III	240	II	11 wks.
H. S.	34	III	III	168	III	III	256	III	12 wks.
C. E.	67	IV	IV	208	IV	IV	261	II	8 wks.
M. B.	41	IV	IV	177	IV	IV	238	III	6 wks.
V. H.	43	III	III	274	III	III	213	II	10 wks.
E. C.	68	IV	IV	217	IV	III	281	III	9 wks.
S. L.	51	III	III	214	III	III	233	II	28 wks.
T. C.	35	III	IV	223	III	III	270	II	32 wks.
F. M.	44	IV	IV	152	IV	IV	190	III	6 wks.
G. B.	53	III	III	300	I	I	310	I	80 wks.
M. D.	52	III	III	235	III	III	262	III	6 wks.
N. C.	35	II	IV	248	II	IV	279	III	7 wks.
L. C.	68	III	III	275	III	III	254	III	8 wks.
G. D.	44	III	III	244	III	III	277	IV	0
J. D.	36	II	II	282	II	II	298	II	14 wks.
M. Mc.	36	I	III	227	I	II	333	II	16 wks.
F. W.	47	III	IV	258	III	IV	280	III	6 wks.
Average				228			267		

mentation rate, abnormal glucose tolerance, decreased plasma albumin, increased fibrinogen, increased alpha<sub>1</sub>, alpha<sub>2</sub> and gamma globulins, and negative calcium balance.

Nitrogen mustard therapy resulted in positive calcium balance, a slight increase in plasma albumin and slight decreases in alpha<sub>1</sub>, alpha<sub>2</sub> and gamma globulins.

Nitrogen mustard did not exhibit a cortisone-like effect.

The improvement observed during the control period emphasizes that adequate diet, aspirin, physical therapy, and psychotherapy remain the treatment of choice.

Nitrogen mustard was employed as an experimental form of therapy and is not recommended for routine treatment of rheumatoid arthritis.

### Discussion

Nitrogen mustard, according to Karnofsky<sup>22</sup>, is a toxic drug whose effect on various tissues is proportional to the rate of mitotic division and the metabolic activity. The tissues most affected

by the drug are thymus, spleen, lymph nodes, reticulo-endothelial cells, bone marrow and gastro-intestinal mucosa. Nitrogen mustard inactivates several enzyme systems, particularly choline oxidase, acetylase and esterase. Approximately fifty per cent of the drug combines with glutathione, ten per cent with cellular enzymes, and an unknown percentage with immunologic proteins and certain nucleoproteins. Therapeutic doses range from 0.2 to 0.6 mg./kg. The fatal dose ranges from 1 to 2 mg./kg. Cumulative effects do not occur if doses are spaced more than four weeks apart.

The main hazards of nitrogen mustard therapy are severe leukopenia and thrombocytopenia. There is a theoretical possibility of inducing mutations in the children of patients treated with this drug. Accordingly, patients were selected in such a manner as to minimize the hazards. The drug was not given to patients who had received ACTH or cortisone in the preceding six weeks, since there is a tendency for these drugs to increase the sensitivity of bone marrow to nitrogen mustard<sup>22</sup>. It was, also

## RESULTS of TREATMENT with:

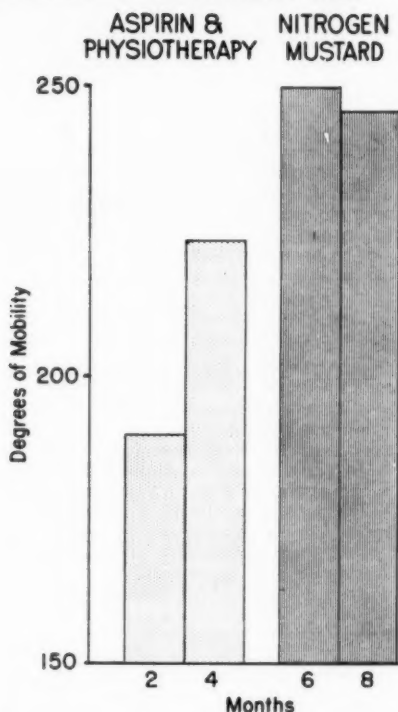


Fig. 7 — Average mobility index for the ten patients on the metabolic ward. The first bar represents average joint mobility upon admission and during first period of observation. Bars two, three and four show the increase in average mobility obtained by treatment in the second (aspirin), third and fourth periods (nitrogen mustard).

not administered to patients with acute infections and was withheld from those who expected to have children. No serious complications were observed in any of the patients in this series.

While the mechanism of action of nitrogen mustard is not yet clear, it is evident from these studies that it may not be similar to that of cortisone. This is shown by the lack of the following: hirsutism, elevation of blood pressure, edema, acne, or "moonface." Changes in eosinophil counts, erythrocytes, sedimentation rates, 17-ketosteroid excretion, glucose tolerance, and calcium excretion did not reflect a "cortisone-like" effect.

Little is known about the calcium

metabolism of patients with rheumatoid arthritis. Factors which favor a loss of calcium include rest and immobility, fever, dietary deficiencies and diets containing abnormally high quantities of phosphorus. Since activity was encouraged in our patients and they were fed an adequate diet it is probable that these factors did not attribute to the loss in calcium.

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### — MEMBERSHIP NEWS —

Archives of Physical Medicine and Rehabilitation

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Who?

What?

Where?

When?

Why?

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## MEDICAL NEWS

*Members are invited to send to this office items of news of general interest, for example, those relating to society activities, new hospitals, education, etc. Programs should be received at least six weeks before the date of meeting.*

### PERSONALS

On May 1, 1954, **Ben L. Boynton**, Chicago, was appointed Medical Director of the Course in Physical Therapy at Northwestern University Medical School. — **Karl E. Carlson** has returned to private practice following a second tour of duty in the U.S.A.F. He is now director of the Department of Physical Medicine and Rehabilitation at the Palo Alto (Calif.) Clinic. — **Stanley F. Radzyninski**, Wadsworth, Kansas, was guest speaker at the semi-annual meeting of the Midwest Chapter of the American Association of Rehabilitation Therapists. His subject was "Medical Progress Notes." — **John McM. Mennell**, Fishersville Va., has been appointed Lecturer in Medical Orthopedics and Director of Physical Medicine at the University of Virginia. — **Robert C. Darling**, New York, participated in the Region II conference of the National Rehabilitation Association recently held at West Point, N. Y.

The Roane County (Oak Ridge, Tenn.) Medical Society heard **Arthur M. Pruce**, Atlanta, Ga., discuss "Management of Common Back and Extremity Problems"; Dr. Pruce also discussed "Office Physical Therapy" at a meeting of the Cobb County (Georgia) Medical Society. — **Michael M. Dacso**, New York, was a dinner speaker at the Annual Meeting of the Vermont Tuberculosis and Health Association in Burlington. The subject of his speech was "Rehabilitation Vs. Custodial Care." He also participated in a meeting with state legislators where medical problems of the aged population were discussed. "Rehabilitation Problems of the Aged" was the topic selected by Dr. Dacso for presentation at the Mary Fletcher Hospital in Vermont. — **A.B.C. Knudson**, Washington, D. C., was guest speaker at the meeting of the section on physical medicine held in conjunction with the annual meeting of the Massachusetts Medical Society; his topic was "Physical Medicine and Rehabilitation: Our Challenge and Obligation." — **James G. Golseth**, Pasadena, Calif., was guest speaker

at the Los Angeles Society of Ophthalmology and Otolaryngology; Dr. Golseth spoke on "The Diagnostic and Prognostic Value of Electromyography and Electrodiagnosis in Seventh Nerve Lesions." — **Arthur Steindler**, Iowa City, was installed as an honorary fellow of the Royal College of Surgeons, in London. Dr. Steindler addressed the orthopedic section of the British Medical Association and the student body of the medical school at Cardiff, Wales.

**Louis B. Newman**, Chicago, addressed the Multiple Sclerosis Foundation of America at the Spaulding School in Chicago; his topic was "The Role of Physical Medicine and Rehabilitation in Multiple Sclerosis." Dr. Newman also addressed the Women's Auxiliary of the MacNeal Memorial Hospital, Berwyn, Ill. — **Grace Roth**, Rochester, Minn., spoke on "You and Your Heart" at a meeting of the Scandinavian Club in Rochester; Dr. Roth participated in the scientific program of The Society for Investigative Dermatology, Inc. Her presentation was entitled "Further Contributions to the Vascular Physiology of Patients with Atopic Dermatitis." — **James Rae**, Ann Arbor, Mich., and **Keith Keeler**, Akron, Ohio, participated in the Regional Conference of the National Rehabilitation Association and National Association for Sheltered Workshops and Homebound Industries. — **S. Malvern Dorinson**, San Francisco, discussed "How to Prescribe Occupational Therapy" at a meeting of the Northern California Occupational Therapy Association. — **C. G. Psaki**, Philadelphia, was guest speaker at the Kiwanis Club of Garden City (N. Y.); his subject covered the latest prosthetic devices developed by the National Research Council for upper and lower extremity amputees. — **Lt. Col. Raoul C. Psaki**, San Francisco, conducted a Post Graduate Course on "Rehabilitation Technics in Neuromuscular Diseases and Disabilities" at Letterman Army Hospital. — At the regular meeting of The Trudeau Society, **Elizabeth Austin**, Los Angeles, spoke on "Pulmonary Complications in Acute Poliomyelitis." —

**Herman J. Bearzy**, Dayton, Ohio, was one of the guest speakers in the FREE MEDICAL FORUMS sponsored by The Dayton Daily News and the Montgomery County Medical Society. Dr. Bearzy participated in the Forum on Arthritis and Rheumatic Diseases.

#### IMPORTANT CORRECTION

The following correction should be made to the membership roster which was published in the March 1954 issue of the ARCHIVES. Dr. Ray Piaskoski's Society affiliation was omitted from his membership listing on page 185. He is a member in good standing of the American Society of Physical Medicine and Rehabilitation. The editorial staff regrets any inconvenience to Dr. Piaskoski resulting from this oversight.

#### NEW OFFICERS FOR CHICAGO SOCIETY PM&R

At the regular meeting of the Chicago Society of Physical Medicine and Rehabilitation held on April 28, 1954, the following officers were elected for 1954-1955: President, Irvin F. Hummon, Jr.; Vice-President and Program Chairman, Joseph L. Koczur; Secretary-Treasurer, Gusta Davidsohn. Serving as Trustees are Maxwell Flank; Y. T. Oester, and Gusta Davidsohn.

#### APPARATUS ACCEPTED

The following information relative to apparatus accepted by the Council on Physical Medicine and Rehabilitation of The American Medical Association is reprinted, with permission, from the April 24, 1954 issue of The Journal of The American Medical Association.

**Signal Dry Bed Alarm, Model A:** Signal Trainer Co., 3357 Mission St., San Francisco 10.

The Signal Dry Bed Alarm is used for awakening patients who are undergoing treatment for enuresis. It consists of a control box powered by a 6 volt battery of dry cells and a pad that is placed on the bed under the sleeper. The bed pad measures 61 by 46 cm. (24 by 18 in.) and is connected to the control box by a cable. The control box measures 16.5 (height) by 26 by 15 cm. (6½ by 10 by 6 in.) and weighs 2.4 kg. (5 lb. 6 oz.). The entire assembly is packaged in a carton measuring 27 by 41 by 29 cm. (10½ by 16 by 11½ in.) and weighing 3.9 kg. (8 lb. 9 oz.).

When the bed pad is moistened by a conducting fluid, such as a dilute sodium chloride solution or urine, the buzzer sounds; an increased amount of fluid causes the buzzer to sound louder.

Evidence from sources acceptable to the Council showed that the apparatus was of sound construction and of value if properly used under the supervision of a physician in

selected cases. An apparatus of this type if misused could inflict severe psychic trauma on an enuretic child. The manufacturer supplied evidence to show that the promotional methods used were such as to safeguard the interests of the patient.

#### NEW APPOINTMENT FOR DR. MEAD

Dr. Sedgwick Mead, Associate Professor and Director of the Division of Physical Medicine of Washington University in St. Louis and Director of the Department of Physical Medicine at Barnes Hospital in St. Louis has accepted an appointment as Medical Director of the California Rehabilitation Center at Vallejo, effective July 1, 1954.

Sponsored by The Kaiser Foundation, the California Rehabilitation Center conducts the nation's largest non-governmental program dedicated to the neuromuscular rehabilitation of children and adults physically handicapped by various types of paralysis.

Dr. Mead is a diplomate of the American Board of Physical Medicine and Rehabilitation. He is a member of numerous medical societies, including the American Medical Association, the American Congress of Physical Medicine and Rehabilitation, the American Academy for Cerebral Palsy, the American Association for the Advancement of Science and the American Society of Physical Medicine and Rehabilitation. He is on the Medical Advisory Committee of National Foundation for Infantile Paralysis. Thirty-one scientific papers have been published by Dr. Mead since 1935.

Dr. Mead and his wife, Marjorie, with their two young sons, Sedgwick, Jr. and Marshall will live in Vallejo.

#### PRESIDENT EMERITUS

William T. Sanger, Ph.D., has become the second president emeritus in the history of the National Society for Crippled Children and Adults, the Easter Seal Society. One of the nation's most distinguished medical educators, Dr. Sanger is immediate past president of the National Society and for twenty-six years has been head of the Medical College of Virginia. Dr. Sanger was elected to his new honorary post by the unanimous vote of the Easter Seal Society's Board of Trustees.

#### ELECTIONS TO MEMBERSHIP AMERICAN COLLEGE OF PHYSICIANS

On April 4, 1954 at the annual convocation of the American College of Physicians the following Congress members were elected to membership: Fellows — Lewis Dickar and Samuel G. Feuer of Brooklyn; Associate Fellows — Lewis Cohen of Detroit, and Bernard Stoll of Chicago.



### LATIN AMERICAN CONGRESS OF PHYSICAL MEDICINE

The Latin American Congress of Physical Medicine held its annual dinner on April 26, 1954, at the Grand Street Boys Club Association, New York. The Pan-American Academy of General Practice and the Spanish-American Medical Association of New York were hosted at this dinner meeting. Serving on the Dinner Committee were Norman E. Titus, William Bierman, Hans J. Behrend, Richard E. Gordon, Arturo Martinez, and Madge C. L. McGuinness.

### ELECTRICAL DEVICES BARRED

Thirteen electrical devices, which have been widely distributed for the diagnosis and treatment of serious diseases, were barred from shipment in interstate commerce by an injunction decree entered in the Federal district court at San Francisco.

The Electronic Medical Foundation of San Francisco consented to the entry of the decree, which is also binding upon the officers of the Foundation and all persons in active concert or participation with them.

The Food and Drug Administration, U. S. Department of Health, Education, and Welfare, which initiated the injunction suit, estimates that there are about 5,000 of the devices now in the offices of various fringe practitioners throughout the country. The names of the machines are as follows: Oscilloclast, Oscillotron, Regular Push Button Shortwave Oscilloclast, Sweep Oscillotron, Sinusoidal Four-in-One Shortwave Oscillotron, Galvanic Five-in-One Shortwave Oscillotron, Depolaray Chair, Depolatron Chair, Depolaray Junior, Electropad, and New Depolaray Junior.

In addition to these machines the decree bans interstate shipment of "Blood Specimen Carriers" for use in a diagnostic machine, the Radioscope, which is maintained at the Foundation's offices in San Francisco. It also bans the shipment of any similar electrical devices for producing or measuring low-power radio waves or magnetic energy or any accessories or parts of such devices.

The Government charged that all the devices are misbranded, since they are not capable of diagnosing or curing any disease, much less the hundreds of serious diseases which it was claimed they will diagnose and treat effectively.

According to the injunction complaint, the Foundation's activities were divided into two major parts: The sale of blood "diagnostic" service and the distribution of "therapeutic" devices. The diagnostic service was based upon the theory that any ailment can be diagnosed by measuring emanations from a dried blood spot on sterile paper. Practitioners who mailed in the blood spots taken from their patients received, for a fee, a diagnosis

blank filled in with the diseases each patient was supposed to have, their location in the body, and the recommended "dial settings" for treatment with the Foundation's devices.

The Government charged that the Radioscope was represented as a "tuning apparatus," by which the defendants asserted it is possible to distinguish the alleged characteristic "radio frequencies" associated with different diseases. This device is a box containing dials, lights, and wires, and a slot in which may be placed a specimen carrier of filter paper bearing dried blood of the patient. Metal plates connected with the box are held by a person who is designated the "reagent" and who is supposed to serve as a "detector" for the radiations allegedly emanating from the blood spot. The operator of the machine strokes the abdomen of the "reagent" with a plastic wand. If the wand "sticks" to a particular location, that is supposed to be a manifestation of an "electronic reaction," and the operator allegedly can determine from this the identity, kind, location and significance of any disease present.

Investigating the blood diagnostic service, Food and Drug inspectors found it was incapable of distinguishing the blood of animals or birds from that of man, or that of the living from the dead. Inspectors arranged to submit blood from an amputee and got back a report of arthritic involvement of the right foot and ankle which the man had lost several years before.

The blood of a dead man brought a diagnosis of colitis, while a sample from an 11-week-old rooster submitted for a "recheck" on the previous diagnosis of a man, resulted in a report of sinus infection and dental caries. When a hamster's blood was sent in as that of a man, inspectors received a diagnosis of "tuberculous involvement," melancholia, and mixed toxins of the colon.

A spot of coal-tar dye sent as the blood of a woman was reported to indicate systemic toxemia contributing to lowered vitality and anemic tendencies.

FDA physicians found that in general the diagnostic reports consisted of a potpourri of medical jargon. A large portion of the reports refer to "common cold toxins," "colonic toxemia," and "lowered glandular functions," combined with references to the patient's history as supplied by the practitioner.

Each report included dial settings for treatment with the various "therapeutic" machines distributed by the Foundation. Laboratory tests of the latter equipment made by FDA scientists showed that the machines are of two types or combinations of these. One type consists of a coil producing a magnetic field similar to that created by home electric appliances such as a vacuum cleaner or electric doorbell. The other type is a low-powered transmitter generating radio waves in the 43-megacycle region (i.e. the short

wave band used by police, bus companies, railroads, etc.). Extensive tests of the devices showed that they are worthless for any therapeutic purpose.

The Foundation's literature, distributed to practitioners throughout the country, recommends use of the machines for treating hundreds of disease conditions including Anemia, Angina pectoris, Asthma, Breast tumors, Bursitis, Cancer, Cataract, Coronary thrombosis, Cystitis, Enlarged prostate, Gastric ulcer, High blood pressure, Hyperthyroidism, Inflammatory rheumatism, Inguinal hernia, Mastoiditis, Septic sore throat, and Uterine tumors.

Treatments are also recommended for minor or symptomatic conditions such as colds, backache, hornet stings, coughing, confusion, dizziness, indigestion, nausea, vomiting, night sweats, loss of weight, rapid heart, etc.

The injunction decree prohibits the shipping of any device which is misbranded under the Federal Food, Drug, and Cosmetic Act because of any representation or suggestion in the labeling that it has value in the treatment or diagnosis of the diseases listed in the complaint or any other kind of disease, or has value in affecting any structure or function of the body; or which purports to produce low power radio waves or electro-magnetic energy, or low-frequency alternating magnetic energy which, when applied to the body, "normalized" diseased tissue, thereby correcting disease conditions.

The Foundation, formerly the College of Electronic Medicine, was set up by the late Dr. Albert Abrams, inventor of the machines, to perpetuate his electro-medical theories. Fred J. Hart, president, has informed the Food and Drug Administration that research on the utility of the devices will be continued in Germany and Mexico, and that a magazine, "The Electronic Medical Digest," will continue to be published.

#### AUTOMOBILE EXHAUST PRODUCTS AND CANCER

A study of automobile exhaust products to assess their possible role in causing the increase of lung cancer in urban areas was urged by Dr. Hans L. Falk, of the University of Southern California, at the recent convention of the Industrial Medical Association.

According to Dr. Falk, a preliminary study was made in Los Angeles on this subject. There are 2 million cars driven an average of 15 million miles a day in Los Angeles, adding their pollution product to an already highly polluted atmosphere, called smog. Dr. Falk explained that extracts of gas engine exhaust samples which, analysis has shown, contain aromatic polycyclic hydrocarbons—a product of incomplete combustion—were used in biological carcinogenic studies on black mice.

The first carcinoma appeared 390 days after the tests began. Of 86 mice treated 38 got tumors. Of the 42 used as controls, none were affected.

#### BOOKS RECEIVED

Books received are acknowledged in this column as full return for the courtesy of the senders. Reviews will be published in future issues of the journal. Books listed are not available for lending.

**Dynamics of Growth Processes** edited by Edgar J. Boell: Princeton University Press, Princeton, N. J.

**The Motion of the Heart: The Story of Cardiovascular Research** by Blake Cabot; Harper & Brothers, New York.

**The American Sexual Tragedy** by Albert Ellis; Twayne Publishers, New York.

**Sex Life of the American Woman and the Kinsey Report** by Albert Ellis; Greenberg, Publisher, Inc., New York.

**You and Your Skin** by Norman R. Goldsmith; Charles C. Thomas, Springfield, Ill.

**The British Contribution to Medicine** by Jaime Jaramillo-Arango; Williams & Wilkins Company, Baltimore, Md.

**Connective Tissues: Transactions of the Fourth Conference February 18, 19 and 20, 1953, Princeton, N. J.** edited by Charles Ragan; Josiah Macy, Jr., Foundation, New York.

**Atlas of Orthopedic Traction Procedures** by Carlo Scuderi; The C. V. Mosby Company, St. Louis, Mo.

**Medizinische Poliklinik: Vorlesungen über innere Medizin** by Erwin Schliephake; Gustav Fischer, Jena, Germany.

**Guide to Standards for Resident Camps for Crippled Children** published by The National Society for Crippled Children and Adults, Chicago.

**Physiology in Diseases of the Heart and Lungs** by Mark D. Altschule; Harvard University Press, Cambridge, Mass.

**Add Life to Your Years** by Ernst P. Boas; Medill McBride Company, New York.

**The Biochemistry of the Nucleic Acids** by J. N. Davidson; John Wiley & Sons, Inc., New York.

**Principles of Exercise Therapy** by M. Dena Gardiner; The Macmillan Company, New York.

**Orthopädische Gymnastik. 2, umgearbeitete Auflage, 1949** by G. Hohmann; Georg Thieme Verlag, Stuttgart, Germany.

**Our Advancing Years: An Essay on Modern Problems of Old Age** by Trevor H. Howell; The Macmillan Company, New York.

**Das Klapp'sche Kriechverfahren, 1952. VIII** by B. Klapp; Georg Thieme Verlag, Stuttgart, Germany.

**The Effect of ACTH and Cortisone Upon Infection and Resistance** by Gregory

Shwartzman; Columbia University Press, New York.

**Leibesübungen mit Koperbeschädigten Band 1.** 1951. by H. Lorenzen; Georg Thieme Verlag, Stuttgart, Germany.

**Leibesübungen etc. Band 2.** 1953 by H. Lorenzen; Georg Thieme Verlag, Stuttgart, Germany.

**Narcotics and Narcotic Addiction** by David W. Maurer and Victor H. Vogel; Charles C. Thomas, Springfield, Ill.

**Lectures on the Thyroid** by James Howard Means; Harvard University Press, Cambridge, Mass.

**So lernt das Kind sich gut zu halten.** 1952. by M. Scharll; Georg Thieme Verlag, Stuttgart, Germany.

**Fußgymnastik mit Kindern.** 1951. by M. Scharll; Georg Thieme Verlag, Stuttgart, Germany.

**Hygiene des Fußes** by F. Schede; Georg Thieme Verlag; Stuttgart, Germany.

**Metabolism of Steroid Hormones** by Ralph I. Dorman and Frank Ungar; Burgess Publishing Company, Minneapolis, Minn.

**How to Be a Woman** by Lawrence K. and Mary Frank; Bobbs-Merrill Company, Inc., Indianapolis, Ind.

**Advances in Cancer Research Volume II** by J. P. Greenstein and Alexander Haddow; Academic Press Inc., New York.

**The Process of Psychotherapy** by Harrington V. Ingham; McGraw-Hill Book Company, Inc., New York.

**Illustrated Review of Fracture Treatment** by Frederick Lee Liebolt; Lange Medical Publications, Los Altos, Calif.

**Nerve Impulse: Transactions of the Fourth Conference March 4, 5 and 6, 1953** edited by David Nachmansohn; Josiah Macy, Jr., Foundation, New York.

**The Deluge: A Novel** edited by Robert Payne; Twayne Publishers, New York.

**Living Your Later Years** by Kenneth Walker; Oxford University Press, New York.

**Radioactive Isotopes: An Introduction to their Preparation, Measurement and Use** by W. J. Whitehouse and J. L. Putman; Oxford University Press, New York.

**British Medical Bulletin: Reactions to Injury Volume 10** compiled by Medical Department, The British Council, 65 Davies Street, London W. 1, England; Oxford University Press, New York.

**Clinical Disorders of the Heart Beat** by Samuel Bellet; Lea & Febiger, Philadelphia.

**Surgical Appliance Technician's Handbook** by Howard L. Boyland; Surgical Appliance Industries, Inc., Cincinnati.

**Construction, Fitting and Alignment Manual for the U. S. Navy Soft Socket Below Knee Prosthesis** by Thomas J. Canty; Amputation Center, U. S. Naval Hospital, Oakland, Calif.

**The Hepatic Circulation and Portal Hypertension** by Charles G. Child, III; W. B. Saunders Company, Philadelphia.

**Current Therapy, 1954; Latest Approved Methods of Treatment for the Practicing Physician** by Howard F. Conn; W. B. Saunders Company, Philadelphia.

**Annual Review of Medicine Volume 5** edited by Windsor C. Cutting; Annual Reviews, Inc., Stanford, Calif.

**Mayo Clinic Diet Manual**; W. B. Saunders Company, Philadelphia.

**Three Men: An Experiment in the Biography of Emotions** by Jean Evans; Alfred A. Knopf, Inc., New York.

**Cold Injury: Transactions of the Second Conference, November 20 and 21, 1952** edited by M. Irene Ferrer; Josiah Macy, Jr., Foundation, New York.

**Hypertension and Nephritis (Fifth Edition)** by Arthur M. Fishberg; Lea & Febiger, Philadelphia.

**Aphasia Therapeutics** by Mary C. Longrich and Jean Bordeaux; The Macmillan Company, New York.

**Mitchell's Pediatrics and Pediatric Nursing** by Robert A. Lyon and Elgie M. Wallinger; W. B. Saunders Company, Philadelphia.

**Pneumonia** by Hobart A. Riemann; Charles C. Thomas, Springfield, Ill.

**Physics for Medical Students** by J. S. Rogers; Cambridge University Press, New York.

**Energy Metabolism and Nutrition** by Raymond W. Swift and Cyrus E. French; Scarecrow Press, Washington, D. C.

**Proceedings of First Congress of the World Confederation for Physical Therapy, September 7-12, 1953, London**; Chartered Society of Physiotherapy, London, England.

#### NEWLY REGISTERED THERAPISTS

##### March 17, 1954

Bandy, James Allen, 558 Locust St., Dubuque, Iowa.

Bogard, William David, Jr., 1505 N. Towner, Santa Ana, Calif.

Grove, John Lowell, 325 Capricorn Ave., Oakland 11, Calif.

Hearn, Bonnie Lee, 158 Old Toll Rd., Watsonville, Calif.

Lane, Mildred Constance, PO Box 484, San Bernardino, Calif.

Lohne, Johan, 1914 Michigan Ave., Los Angeles 33, Calif.

Nakamura, Mitsusuke, Box 602, Kahuku, Oahu, T. H.

Novikoff, Irene, 176 Robinwood Dr., San Francisco 27, Calif.

Showers, Marian, 2895 Riverbend Rd., Salem, Ore.

Szumelda, Alexandra, 1508 Micheltorena St., Los Angeles 26, Calif.

##### March 20, 1954

Kelley, Millard S., 2400 El Camino Real, Mountain View, Calif.

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April 15, 1954

Bedell, Sidney, 118 Vernon Ave., Brooklyn 6, N. Y.

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April 27, 1954

Hoganson, Ruthe Rondeau, 3022 Enoch Ave., Zion, Ill.

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April 29, 1954

Kraszeski, Patricia Young, 7 Beresford Lane, Larchmont, N. Y.

Laurence, Dorothea Enid, 745 E. 105th St., Cleveland 8, Ohio.

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May 6, 1954

Evans, Frederick Carlyle, Jr., Diesel Housing Unit, Richmond, Va.  
Thompson, Barbara Wolsey, 152 Pond St., Winchester, Mass.

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May 26, 1954

Crawford, Marjorie M., Box 595, Grimsby, Ontario, Canada.

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## PHYSICAL MEDICINE ABSTRACTS

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**Pediatric Occupational Therapy: A Reappraisal.** Glenda Swartout, and Roy Swartout.

J. Pediatrics 44:112 (Jan.) 1954.

The role of occupational therapy in helping hospitalized children express and release their fears is explained. Some of the media used are discussed to illustrate how they can be adapted to bedfast children. The present study was limited to children five through twelve years of age; creative activities used were finger painting, clay work, papier-mache, modeling with a mixture of sawdust and paste, weaving, sewing, wood rasp carving, block construction, and puppet construction.

**Studies on Galvanotaxis of Leukocytes.** K. Fukushima; N. Senda; H. Inui; H. Miura; Y. Tami, and Y. Murakami.

Medical Journal of Osaka University 4:195 (Nov.) 1953.

Leukocytes evidence a function of taxis on electric stimulation. This taxis has been designated as galvanotaxis of leukocytes. A study of healthy adults was made in which leukocytes were suspended in an isotonic buffer solution and blood plasma and were spread between a cover slip and a slide glass. The thin layer thus obtained is electrified. Microscopical observation of the leukocytic move-

ment ascertained the presence of galvanotaxis in leukocytes.

The neutrophilic leukocytes of whole blood, suspended in blood plasma or in the isotonic buffer solution reveal a positive galvanotaxis. The galvanotaxis of neutrophilic leukocytes has a threshold of adequate stimulation, the intensity of which is the same as in whole blood, as well as in blood plasma and in an isotonic buffer solution (pH7.1-7.5). The direction of galvanotaxis of neutrophilic leukocytes is influenced by H-ion concentrations. On measurement of values of galvanotaxis, the rate of net approach and the rate of locomotion, the galvanotaxis of neutrophilic leukocytes can be represented by mathematical figures.

**Serum Hepatitis in Recipients of Irradiated Human Plasma. A Follow-Up Study of Patients Receiving Plasma Prepared from Pools Containing Contributions from 3,000 to 30,000 Donors.** Morton P. Eanet.

Am. Pract. & Digest Treat. 5:145 (Mar.) 1954.

In spite of the encouraging experimental work in the prevention of serum hepatitis by ultraviolet irradiation, reports began to appear in 1950 of cases of serum hepatitis presumably transmitted by irradiated plasma, and irradiated immune human serum. The gradual replacement of the nonirradiated

plasma which the U. S. Army had on hand in Korea at the beginning of hostilities by irradiated plasma was not accompanied by a decline in the incidence of serum hepatitis in battle casualties receiving plasma.

A follow-up study of recipients of certain units of dried irradiated plasma prepared from reworked pools containing donations from 3,000 to 30,000 individuals was undertaken. From 27 recipients on whom follow-up studies were obtained, three cases of serum hepatitis and one probable case were found to have occurred. Attack rates for serum hepatitis in recipients of whole blood and in control hospital populations, which would include the occasional transmission of this disease by improperly sterilized syringes and needles, are less than one per cent.

Ultraviolet irradiation does not appear to have been successful in removing this hazard from the potentially infectious pools studied. The use of large numbers of samples in the composition of plasma pools did not prevent serum hepatitis by diluting the virus below the point of infectivity.

#### An Evaluation of Certain Vasodilator Drugs by a Heat Flow Technic. B. N. Catchpole, and R. P. Jepson.

Circulation 9:408 (Mar.) 1954.

A great need in clinical practice for an efficient method of increasing the blood flow in the extremities of patients suffering from acute, chronic or intermittent ischemia exists. A surgical or chemical sympathectomy may be an unsatisfactory or inadequate procedure or be contraindicated by reason of the age or general condition of the patient. Many drugs have been studied in recent years which cause a peripheral vasodilation by their action at various levels in the neuroeffector chain. Some of these have been abandoned following a critical clinical and experimental evaluation because of their inefficiency or their unpleasant and dangerous side effects.

This paper reviews four drugs which have been reported to have vasodilator actions. All have been administered parenterally under controlled conditions to normal subjects and to a group of patients suffering from degenerative arterial disease in the lower extremity.

The following drugs were studied: (a) 2-benzyl-4, 5-imidazoline hydrochloride (Tolazoline, B.P. or Priscoline); (b) 2 [N-p'-tolyl-N-(m'-hydroxyphenyl)-a m i n o methyl] imidazoline (Regitine); (c) the methanesulfonate derivatives of dihydroergocornine dihydroergocristine and dihydroergokryptine (Hydergine); (d) pentamethyldiethyl-3 azapentane-1, 5-diammonium dibromide (P-9295).

The general usefulness of ganglionic blocking agents such as tetraethylammonium bromide and hexamethonium is limited. They are incomplete, nonselective and transient in

their actions, producing a general blockade of the autonomic system with resultant unpleasant and possibly dangerous side effects such as hypotension. Furthermore their action is more pronounced in the normal than in the atherosclerotic limb. P-9295 would appear to have the failings of this class of drug.

The authors agree with previous findings that the action of vasodilator drugs on the blood flow to limbs of patients suffering from occlusive arterial disease is quantitatively less than in normal subjects, and that their effectiveness does not justify repeated arterial puncture. Indeed, in the hypertensive patient, the fall in blood pressure which is often induced may cause an additional embarrassment to the ischemic limb. When possible, reflex vasodilatation and sympathetic nerve interruption would in every way appear to be more satisfactory and efficient methods of increasing peripheral skin blood flow. It is concluded that the effectiveness of the drugs does not justify repeated arterial puncture.

#### An Exploratory Study of the Full-Range Picture Vocabulary Test with Mental Defectives. William Sloan, and Gerard J. Bensberg.

Am. J. Ment. Deficiency 58:481 (Jan.) 1954.

In persons with multiple handicaps, evaluation for the presence of mental deficiency has been difficult since physical handicaps tend to reduce the apparent functioning level. Results of this study indicate that the Full-Range Picture Vocabulary Test correlates satisfactorily with the Stanford-Binet, although scores on the former tend to be seven months higher in Mental Age than those on the Stanford-Binet, when both tests are used with mental defectives. Scores did not appear to be affected by length of institutionalization or chronological age. The advantage of the test is that it utilizes only symbolic responses and the person tested is required only to identify the picture defining the word.

#### Metabolic Adjustments to Normal and Disturbed Circulation in Man. Elliot V. Newman.

New England J. Med. 250:347 (Mar.) 1954.

In the performance of usual physical activity, the normal circulatory apparatus is called upon to supply varying amounts of blood to tissues. It has been well demonstrated that the normal circulation does not respond with enough rapidity or quantity of blood to maintain the metabolic condition of the tissues in a compensated or "steady" state. The normal man who rises from his bed to walk makes metabolic as well as circulatory adjustments in response to the activity. Until the output



of the heart and the delivery of blood to the working tissues catch up with the demands, the tissues themselves must supply energy from their stores.

These metabolic adjustments are part of the functional equipment of all normal people. They are made in response to the energy demands of any physical activity.

The normal person and the patient with cardiac failure have qualitatively the same mechanisms of metabolic adjustment to the circulation. The patient with cardiac insufficiency differs only in duration and severity of the metabolic adjustments. The kidney is ultimately responsible for a specific retention of sodium and chloride. Specificity is demonstrated by the separation of the effects of exercise on water and sodium chloride excretion by the use of Pitressin, alcohol and bandages on the legs. The hemodynamic event that is strikingly different in cardiac failure is the rise in venous pressure. Some of the stimulus that ultimately reaches the kidney may arise in the veins, and perhaps in the vessels of the legs. At any rate, alteration of the pressure relations in the legs has a considerable modifying effect on the sodium chloride retention that occurs with the common stress of standing.

#### Rehabilitation After a Stroke. Murray B. Ferderber.

Pennsylvania M.J. 56:798 (Sept.) 1953.

Statistically speaking, there are over 1,000,000 hemiplegic patients in the United States, making the "stroke" the third major cause of death. Spurred by these statistics, more concise medical, psychologic, social, and economic attention is being focused upon all aspects of this disability. As it is in greater part a disease of the aging and aged, the spearhead is pointed toward this group of our population.

The medical care is well known to general practitioners, but the management too frequently fails to embrace preparation for potential function. This preparation begins at the moment the stroke occurs. The sooner activity is started after the accident, the better are the results and the time until discharge is lessened. In many cases, the physical assets had been barely tapped; only willingness, ability, and motivating stimuli were needed to effect a more mobile existence.

If the vascular system has sufficiently recovered, movement must be considered. Experience shows that the principle of "the older the person, the greater the amount of rest" does not hold true in its entirety. It is also a truism that the older the person the greater and sooner the deterioration.

The emotional impact of a stroke is overwhelming to the patient and to those with whom he associates. For that reason, the management includes not only the individual

afflicted but his family as well.

The sooner the family is contacted and brought into association with the stroke case, the greater is their understanding of the potentialities for some modicum of recovery.

If the care of the patient includes frequent visits, and the family is made a part of the management, the rapport among the physician, patient, and relatives is greater.

Many reports describe the rehabilitation of the stroke case, but they delve into the medical and physical restoration. There needs to be more in the nature of personalized conveniences or "gadgets."

#### Special Diet for Feeding Advanced Spastics and Low Grade Mental Defectives Who Present Feeding Problems. Isaac N. Wolfson; Katherine E. Flack, and Lois West.

Am. J. Ment. Deficiency 58:465 (Jan.) 1954.

This is a report of an experiment tried at the Newark State School, using a special diet formula served in the form of a cereal to overcome difficult feeding problems of severe spastics and helpless low grade patients. Brief records of some of the patients placed on the formula are included. It was found that sixteen of the original twenty-two cases could be fed faster and more satisfactorily on the concentrated food formula. General health appears to be better, little food is lost with this type of feeding, economy of time and labor is affected through its use, and one feeding period per day can be eliminated. The formula is quite economical.

#### Electrically Provoked Muscle-Constrictions as a Form of Psychotherapy in Cerebral Palsy. Joost A. M. Meerlo.

Am. Pract. & Digest Treat. 5:179 (Mar.) 1954.

During the course of physical treatment and muscle re-education of cerebral palsy patients, several psychologic difficulties are encountered which may form resistance to the therapeutic relationship. It is often difficult to make the repeated muscle exercise and attitude correction attractive to the child. However, with the help of rhythm, music and play therapy, these exercises can be used as devices to overcome the child's passivity and resistance.

The author has found it helpful to use a form of electrotherapy as an animating play, helping the patient to develop better muscle control. It is not the usual type of electrotherapy as used in poliomyelitis. Intense electric stimulation in spastic patients would be wrong and in many cases increases the spasticity. The therapy as described is looked upon as psychotherapy, as attention therapy, directing not only the conscious, but also the



unconscious attention of patients to muscle contractions and exercises they were not able to perform previously.

A sinusoidal current strong enough to give painless, rhythmic contractions to special muscle groups is used depending on the place of appliance of the poles; but not so strong that it will increase the spastic contraction.

**Evaluation of Cerebral Palsy Treatment.**  
D. Elliott O'Reilly.

Missouri Med. 51:38 (Jan.) 1954.

A re-evaluation of 145 patients seen in the

clinic of Firmin Desloge Hospital, St. Louis, of whom 123 were diagnosed as cerebral palsy is discussed. Statistics are given on those exhibiting improvement from treatment and those unimproved. Fifty-two per cent exhibited mental retardation and prognosis was best for spastic patients; those with rigidities had the poorest prognosis. Some of the problems encountered in an out-patient clinic are discussed briefly, and the lack of facilities for institutionalization shown. Statistical data are presented on types of treatment, types of defects found, as well as initial and present conditions.

## BOOK REVIEWS

*The reviews here published have been prepared by competent authorities and do not necessarily represent the opinions of the American Congress of Physical Medicine and Rehabilitation and/or the American Society of Physical Medicine and Rehabilitation.*

**THE WECHSLER-BELLEVUE SCALES: A GUIDE FOR COUNSELORS.** By C. H. Patterson. Publication number 148, American Lecture Series, monograph in Bannerstone Division of American Lectures in Psychology. Edited by Molly Harrower, Ph.D., Research and Consulting Psychologist, New York. Cloth. Price, \$3.75. Pp. 146. Charles C Thomas, Publisher, 301-327 E. Lawrence Ave., Springfield, Ill.; Blackwell Scientific Publications, Ltd., 49 Broad St. Oxford, England; Ryerson Press, 299 Queen St., W., Toronto 2B, 1953.

This monograph is a revision and expansion of material prepared in 1948 by the Veterans Administration Regional Office, Minneapolis, under the title, "Using the Wechsler-Bellevue Scales in Counseling." It provides a guide to any who are well oriented in psychometrics, and may be teaching or administering and utilizing the Wechsler Scales for counseling purposes. The potentialities and limitations of the scales are expressed as well as a critical consideration of the use of the scales in clinical diagnosis. There are nine chapters and an excellent detailed bibliography.

The scales are described and suggestions made on reporting results, but the directions for administration of specific items are not included. The excellent point is made that although we cannot consistently make an accurate clinical diagnosis from the results of this test, the clinical value exists in our ability

to utilize the test performance in gaining a better understanding of the individual. The test becomes a projective device for personality factors as well as a measure of intellectual functioning. Consideration is given to the Deterioration Quotient and the conclusion is drawn that at the present time the Wechsler cannot be used as a test of vocational aptitude. The cautions in using the short form of the test are also expressed.

This book provides an excellent survey of studies for those interested in the Wechsler-Bellevue Scales.

**PROGRESS IN ALLERGY. III.** Edited by Paul Kallós. Contributors; J. F. Ackroyd, and others. Cloth. Price, 68.65 Swiss francs (\$16.50). Pp. 572, with 82 illustrations. S. Karger, Holbeinstrasse 22, Basel; Interscience Publishers, Inc., 250 Fifth Ave., New York 1, 1952.

This book, written by thirteen authors of international reputation, skillfully blends our basic knowledge of allergy with newer concepts opened by more recent investigation. An excellent introduction by the editor serves to correlate the various observations as well as surveying current trends in the literature. Each contributor deals with a phase of allergy to which he has devoted long study. Emphasis is placed on the great variety of allergic syndromes with methods of diagnosis and therapy. Attention is called to the mark-

rd influence of psychical factors and other stresses in the course of allergic diseases.

The volume is not intended as a textbook on allergy but furnishes an authoritative reference on the phases of allergy embraced. It is very well written, and an extensive bibliography is offered at the end of each chapter.

**YOUR SKIN AND ITS CARE.** By *Howard T. Behrman, M. D.* and *Oscar L. Levin, M. D.* Price, \$2.50. Emerson Books, Inc., 251 West 19th Street, New York 11.

This small volume written for the lay reader presents the subject of skin hygiene in a practical and scientifically sound manner. The preservation of a good complexion through the use of simple cleansing agents rather than expensive, highly-advertised cosmetics is stressed. An entire chapter is devoted to the fallacies of such articles.

Technics of care of minor skin blemishes are described fully and the logic of treatment of some of the more common serious dermatological conditions explained.

Many patients, particularly adolescents, will derive benefit from this work. It should be available to all student groups.

**DISEASE AND ITS CONQUEST.** By *G. T. Hollis.* With foreword by *Maurice Davidson, M.A., M.D., B.Ch.,* Consulting Physician to Brompton Hospital for Consumption and Diseases of Chest, London. Cloth. Price, \$2.50. Pp. 163. Oxford University Press, 114 Fifth Ave., New York 11; Amen House, Warwick Sq., London. E.C.4, 1953.

This book is difficult to evaluate because it is too simple for the professional reader and probably the vocabulary is too complex for the average person, though the foreword states that it is not intended as a medical compendium for the masses. It would be an excellent book to recommend to intelligent patients, premedical students and the like.

The sixty medical subjects covered include venereal diseases, infectious diseases, tropical diseases and other more common problems such as anemia, varicose veins, hypertension, peptic ulcers, diabetes, etc. Each subject is dealt with in compact form and gives reliable information. The style and vocabulary are delightful and the author presupposes that the reader has no previous knowledge of the topics or terms.

**PHYSIOLOGY.** By *Rolland J. Main,* Ph.D., Formerly Professor of Physiology, Medical College of Virginia, Richmond, Virginia, revised by *Alfred W. Richardson,* Ph. D., Assistant Professor of Physiology, Indiana University School of Medicine,

Bloomington, Indiana. Second edition. Price, \$7.00. Pp. 449, with illustrations. C. V. Mosby Company, 3207 Washington Blvd., St. Louis 3, 1953.

The original purpose of this volume was to present a text of physiology for review purposes while attempting to cover the essentials of the subject. The second edition adheres to this same purpose and contains many simple, clearly understandable diagrams which are used for illustrations and are an important improvement in this addition.

The subject matter is discussed from the standpoint of very broad subdivisions of the field and from the standpoint of the body as a whole rather than as isolated physiological systems. No detailed experimental results are cited, and no references are included. This is in keeping with the purpose, that is, to provide a readily usable summary of physiology for review. For the same reason, the author often assumes, rightly so, that the reader will have certain background information and for this reason can approach a topic in an integrated rather than an isolated manner.

A survey of the field of physiology necessarily leads to the impression or feeling that the writer is often too dogmatic, although this is surprisingly infrequent. It also may leave one who refers to this book for a specific or detailed fact with the wish that more had been included on the particular topic.

This book is enthusiastically recommended for its stated purpose, as a concise review of the field of human physiology. It is well written and is readily understandable. For specific and detailed facts in physiology, it is not recommended, but for study, intensive review, and "refresher" reading in physiology it serves an excellent purpose.

**BESCHOUWINGEN OVER DE VOORBEREIDING EN DE TRAINING VAN DE VLAKKE LOOPKOERSEN IN DE ATHLETIEK.** Door *G. Cortebeek,* Licentiaat in de Lichamelijke Opleiding en *E. Vanden Eynde,* Lesgever aan het Instituut voor Lichamelijke Opleiding. Paper. Price, 45 Belgian francs. Pp. 88. E. Nauwelaerts, Kardinaal Mercierplaats, 2, Leuven, 1953.

The authors discuss the various programs used in conditioning runners for races of 100 to 10,000 meters. No new data are presented. Apparently unaware of the immense amount of research going on in American schools of physical education, the authors content themselves with an exegesis of European publications, some of them not very recent. The absence of an alphabetical index makes it hard to locate subjects of particular interest. Added to the difficulty of the language, which few people in this hemisphere can

read, is the curious change of meaning undergone by English words when adopted into other languages, e. g., "footing" on page 7 and "wandelcross" page 8. The value of this book could have been enormously increased by adding a one-page summary in Interlingua. The general conclusions are that the training of an athlete is too individual a matter to permit strict generalizations and that a healthy population is more valuable to a country than great athletes.

**CALDERWOOD'S ORTHOPEDIC NURSING.** Revised by *Carroll B. Larson, M.D., F.A.C.S.*, Professor of Orthopedic Surgery and Chairman of Department of Orthopedic Surgery, State University of Iowa and *Marjorie Gould, R.N., B.S., M.S.*, Supervisor of Orthopedic Nursing, State University of Iowa; formerly Instructor, Advanced Orthopedic Nursing, Boston University. Cloth. Price, \$5.75. Pp. 687, with illustrations. The C. V. Mosby Company, 3207 Washington Avenue, St. Louis 3, 1953.

This book was written for the students and instructors of orthopedic nursing. The format is simple and clear and makes for easy reading. Throughout the text, which comprises forty chapters, the preventive aspects of nursing are emphasized. Adequate space is given to the subject of decubiti and contractures in paraplegic and other patients. Without ever making mention of the specialty of Physical Medicine and Rehabilitation as part of "the team," much emphasis is placed upon the importance of physiatric modalities, and the nurse is taught that "the regime of treatment should be such that the patient is given the opportunity and motivation to do as much for himself as is humanly possible." When one can even now walk into the hospital room and see the nurse washing the hands of a patient perfectly capable of washing his own hands, it is gratifying to read that this applies to his "personal body" care also.

The disabled child is seen within the frame of reference of the community and family of which he is a part, not just as a case of disability. At the conclusion of each chapter is a fairly comprehensive bibliography. The text should be of value to all nurses who have to deal with disabled patients.

**DISEASES OF WOMEN.** By *Robert James Crossen, A.B., M.D., F.A.C.S.*, Assistant Professor of Clinical Gynecology and Obstetrics, Washington University School of Medicine; Section Head of Unit I. Obstetrics and Gynecology, St. Louis City Hospital; Assistant Gynecologist and Obstetrician to Barnes Hospital and St. Louis Maternity Hospital; Assistant Gynecologist to St. Louis Children's Hospital; Gynecologist and Obste-

trician to St. Luke's Hospital; Member of American Academy of Obstetrics and Gynecology, Central Association of Obstetricians and Gynecologists, American Radium Society, American Society for the Study of Sterility, International Fertility Association; Diplomate of the American Board of Obstetrics and Gynecology. Tenth edition. Cloth. Price, \$18.50. Pp. 935, with 990 illustrations, including 41 in color. The C. V. Mosby Company, 3207 Washington Avenue, St. Louis 3, 1953.

The tenth edition of *Diseases of Women* is an excellent text and offers to the medical student, resident, general practitioner and specialist the basic facts and newer developments in the field of gynecology. Dr. Crossen, in presenting this new edition, has introduced the current concepts of oogenesis and the development of the various ovarian structures. Newer gynecologic diagnostic aids, such as use of the vaginal smear in the detection of early carcinoma, new tests for pregnancy and the employment of culdoscopy, are fully described and illustrated.

The chapters dealing with pelvic relaxation, fistulas and pelvic infection are outstanding. Treatment of urinary incontinence, fistula, and relaxation of the pelvic floor is completely outlined with sequential illustrations of the surgical technics. Limited reference is made to the newer conservative measures of treatment of patients with stress incontinence and pelvic relaxation. Current concepts in the management of pelvic inflammatory disease are stressed, and conservative and surgical procedures are clearly described.

In the chapter on uterine carcinoma, the latest diagnostic technics together with the pathologic features and prevailing concepts on therapy are fully presented. In a special section on radiation therapy, the physics and practical applications of radiation therapy of cancer of the cervix are concisely reviewed.

The text is well written, admirably illustrated, and has a good bibliography and index. It should be an excellent addition to the gynecologist's library, and would provide an authoritative and useful reference for specialists in other fields and for general practitioners.

**NUCLEAR PHYSICS.** By *W. Heisenberg*, Director of Max Planck Institute of Physics, Göttingen. Cloth. Price, \$4.75. Pp. 225, with illustrations. Philosophical Library, Inc., 15 E. 40th Street, New York 16, 1953.

This book is based on a series of popular lectures and was first published in Germany in 1943. It was revised in 1948 and the present English translation contains some of

the newer developments in nuclear physics up to about 1950. It is well written in non-technical language. The opening chapter contains an interesting description of the development of atomic theories from antiquity to the end of the nineteenth century. Then follows a discussion of molecules and atoms with emphasis on Rutherford's and Bohr's work on the atom model. Radioactivity, nuclear particles, artificial nuclear transmutations are followed by discussions of the nuclear forces and nuclear reactions. An interesting chapter describes the tools of nuclear physics, such as the ionization chamber, Geiger counter, Wilson cloud chamber, supervoltage x-ray generator, Van de Graaf static generator, cyclotron and atomic reactor. The uranium-heavy water reactor built by the author in World War II is briefly described in the text and in greater detail in a separate chapter in the appendix of the book, "Research in Germany on the technical application of atomic energy." The author states that this reactor was developed with the idea to use the nuclear energy for power projects and not for the production of atomic bombs, "for the capacity of the already overburdened German industry would not have been sufficient for it." In the last chapter on the practical applications of nuclear energy, the exploitation of this energy for power production, for tracer work in chemistry, biology and medicine and for treatment of diseases is described.

The author's meager reference list of books on nuclear physics contains almost exclusively European publications up to 1949. Of the American literature on the subject only Bethe's book "Elementary Nuclear Theory (1947)" is mentioned together with the English or German editions of three books by Gamov (1932), Rasetti (1937) and Smyth (1947). The book was printed in Great Britain. It is well done with the possible exception of the poor reproduction of the half-tone illustrations, one of which for example, figure 27 "Transmutation of lithium nucleus into two helium nuclei by a proton" can hardly be interpreted. To all those who look for an excellent and almost painless introduction into the mysteries of nuclear physics this book can be highly recommended.

**PEPTIC ULCER: PAIN PATTERNS, DIAGNOSIS AND MEDICAL TREATMENT.** By Lucian A. Smith, A.B., M.D., M.S., Assistant Professor of Medicine, Mayo Foundation, Rochester, Minnesota, and Andrew B. Rivers, M.A., M.D., M.S. Foreword by George B. Eusterman. Cloth. Price, \$12.50. Pp. 576, with 208 illustrations. Appleton-Century-Crofts, Inc., 35 W. 32nd St., New York 1, 1953.

This is a very detailed and complete ex-

position of the clinical problems presented by peptic ulcer. The organization of the book, as well as its illustrations, are excellent. The sections on X-ray diagnosis and gastroscopy are particularly good. Discussion of background physiology omits mention of the important relationships of ACTH and adrenal steroids to gastrointestinal physiology and in the consideration of diagnosis, perhaps too much attention has been given to the place of gastric analysis and degrees of acidity. The discussion of the healing of duodenal ulcer leaves one with the impression that persistent deformity implies continuing disease. The valuable Einhorn "string test" was not included among the diagnostic methods for localization of bleeding sites.

Finally, while a genuine concern with the psychological aspects of peptic ulcer is manifest, there is a punitive attitude toward the patient in this area—"... responsibility for the healing of the ulcer belongs to him and that he should not expect to pass the responsibility to the physician, to the surgeon, or to chance." This attitude implies that the patient's psychological problems are those of control by him and simply require his co-operation. It seems to this reviewer that in the light of what is now known of the dynamics of human psychology, it might have been better for the authors to emphasize what active role the internist may play and where formal psychotherapy may help. Indeed, between the deep psychoanalytic study and the superficial "pat-on-the-back" attitude is a broad middle ground which needs careful and detailed coverage.

The reviewer feels that the book has a real place in the broad presentation of the problem of peptic ulcer.

**HUMAN FACTORS IN AIR TRANSPORTATION: OCCUPATIONAL HEALTH AND SAFETY.** By Ross A. McFarland, Ph.D., Associate Professor of Industrial Hygiene, Harvard School of Public Health, Cambridge, Mass. Cloth. Price, \$13.00. Pp. 830, with illustrations. McGraw-Hill Book Company, Inc., 330 W. 42nd St., New York 18; 95 Farringdon St., London, E.C.4, 1953.

This significant and timely book is a direct outgrowth of developments in aviation and industrial medicine during the past twenty years. It highlights significant changes now taking place in the new medical specialty of aviation medicine. The author's treatment of his subject is so broad in scope that his conclusions are applicable to both civilian and military operations. A number of other subjects are well covered, including the field of the personnel manager, safety superintendent, and the insurance expert. The author at-

tempts to apply the broad principles of public health and preventive medicine to the problem of air transportation in particular, and to other fields of industrial medicine and transportation. Each chapter has inferences and implications for other forms of industry and transport, a fact which tends to belie the title of this auspicious volume.

The scope of the author's work can more realistically be defined as occupational health and safety with particular concern for problems of aviation. He emphasizes the expensive health hazards because of the mechanization of our environment, increased vehicular speed, and various industrial procedures. All of these bring new threats to the safety and well-being of individuals and societies. He emphasizes the importance of prevention of injuries, a field relatively unexplored up to the present time.

The author has analyzed numerous problems of health and safety from an international point of view and demonstrates throughout the book that prevention of disease and disability is an international problem requiring solution on a global basis. He makes a special plea for the free and speedy exchange of medical information, pointing out that there are no barriers in the air spaces, and consequently, there should be no unnecessary restrictions in the dissemination of information regarding public health and accident prevention. A wide range of information from various biologic and engineering sciences has been integrated in the work, which is liberally interspersed with a large number of graphs, statistics and tables.

The book consists of eight parts, a foreword, a preface, an appendix, and a subject index. The several sections of the book are divided into seventeen chapters, each with an extensive bibliography of the widest possible scope.

The subjects covered include the nature and extent of airline operations, selection and training of flight personnel, maintenance of health and efficiency of flight personnel, selection of personnel, safety, sanitation, passenger and service problems, and a general review of health and medical services in air transport. Psychological and psychiatric factors are thoroughly covered and illustrated with results tabulated from twenty representative case histories of pilots suffering from functional disorders. Maintenance of physical fitness of flight crews and the problems of aging are reviewed and are of special interest to the specialist in Physical Medicine and Rehabilitation.

Public Health problems with a review of quarantine regulations and sanitation are also discussed. Other problems incidental to air transport, such as care of passengers suffering from airsickness, apprehension and vibration are reviewed in some detail. The transporta-

tion of patients by air is considered with special reference to indications and contraindications for such transport. These problems are likewise implemented through the use of case histories and special examples.

The author stresses throughout his book the value of preventive medicine and preventive measures in terms of accident prevention, medical protection and air safety. This book is of special interest as a reference work and should likewise be of great value to physicians dealing with the problem of aviation medicine. It has little to offer the average clinician or specialist, except from a standpoint of general interest and perhaps in the matter of considering air transport as a means of patient evacuation.

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THE RADIOLOGY OF BONES AND JOINTS. An Introduction to the Study of Tumors and Other Diseases of Bone. By James F. Brailsford, M.D., Ph.D., F.R.C.P., F.I.C.S. (Hon.); Hunterian Professor, Royal College of Surgeons, England, 1934-5, 1943-4; Founder and first President of the British Association of Radiologists (now the faculty of Radiologists); Emeritus Director of Radiological Studies in Living Anatomy, the University of Birmingham; Consulting Radiologist to the Queen Elizabeth Hospital, Birmingham, the Royal Orthopaedic Hospital, the Accident Hospital and the Warwickshire Orthopaedic Hospital, and other Hospitals of the City; Active Fellow, British Orthopaedic Association; awarded the Robert Jones Gold Medal and Prize of the British Orthopaedic Association, 1927, the Roentgen Prize, 1936, Encomienda Order Civil De Sanidad, Spanish Government, First Dallas B. Phemister Memorial Lectureship, University of Chicago, Hon. Socio Academia of Surgery, Madrid, Hon. Member University of Bordeaux, Hon. Member Roentgen Societies of Chicago, Detroit, New York and Texas. Fifth edition. Cloth. Price, \$19.00. Pp. 890, over 725 illustrations. The Williams & Wilkins Company, Mt. Royal and Guilford Aves., Baltimore 2, 1953.

This edition, the fifth, has been published five years after the previous edition and nineteen years after the first edition which appeared in 1934. In this interval the text, with each edition, has earned a favorable place in the medical literature. The present edition bids well to maintain and advance the reputation of its predecessors. This edition, like each previous one, has been enlarged and augmented. The book now represents "a digest of the work of the author since he was appointed to the Staff of the Pathological Department of the University of Birmingham [England] 46 years ago."

The format of previous editions has been



maintained. Part I describes and divides radiography conveniently on a regional basis and constitutes the major portion of the volume. Included in this section are discussions of normal as well as abnormal conditions of the skeleton and also some diseases which can be conveniently presented because of the nature of their regional involvement. For example, sinusitis and Charcot spine. Other subjects such as fractures, arthritis, tuberculosis, congenital anomalies, some tumors and osteomyelitis are discussed repeatedly in each section as they pertain to the particular region being presented. Part II presents a discussion of some other generalized developmental conditions, dystrophies and diseases of the skeleton. In this section are included also the chapters on granuloma of bone and bone tumors. The text is written in a succinct, semi-outline style utilized more commonly by English than American authors. However, publication in the United States as well as Great Britain attests to the general approval of such a concise, comprehensive, source-reference presentation. Radiographs seem to be as well reproduced as is possible and have been improved with successive editions.

The bibliography is contained in one section at the end of the text. The index is well prepared.

This volume, like its predecessors, is recommended to those whose medical interests encompass the varied radiologic aspects of skeletal development and pathology.

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**THE PATHOLOGY OF TRAUMA.** By *Alan Richards Moritz, M.D.*, Professor of Pathology and Director of the Institute of Pathology of the School of Medicine of Western Reserve University, Cleveland, Ohio. Second edition. Cloth. Price, \$8.50. Pp. 414, with 126 illustrations. Lea & Febiger, Washington Square, Philadelphia 6, 1954.

A new edition of this work was necessary because of the advances in the knowledge of trauma, regardless of cause. World War II not only produced many new types of injuries by missiles to the men in the armed services but also to the civilian population many miles from the battlefields. The trauma produced by the products of the bombs themselves were insignificant compared with those caused by uncontrolled fires, collapsing buildings, explosions, exposure, etc.

A new chapter has been added on medicolegal autopsy. Revisions have been made in the chapters on injuries to the central nervous system and the urogenital tract. In keeping with the new interest in psychosomatic medicine, the author has shown the effect of trauma on this condition. New material has

been added on the infections caused by human bites and scratches; and those due to animal and insect origin. Such subjects as mechanisms and complications of secondary shock, drowning or inhalation of obstructive materials and renal complications of trauma have been rewritten.

This is a volume containing everything that pertains to the effect of trauma—it is complete and up to date. It is a scholarly piece of work that not only contains the definite pathological changes that occur in the different organs and tissues of the body but also the physical, chemical and physiological factors that influence those changes. Here is a book prepared by one of the really outstanding pathologists in this country and one who has devoted a tremendous amount of study and has had many years of experience in this particular phase of pathology. The author has presented the material clearly and concisely and has used excellent illustrations. As each special branch of medicine has one book that is preeminent in all aspects, this book by Dr. Moritz is certainly the classic for this field.

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**THE AUTONOMIC NERVOUS SYSTEM.** By *Albert Kuntz, Ph.D., M.D.*, Professor of Anatomy in St. Louis University School of Medicine, St. Louis. Fourth edition. Cloth. Price, \$10.00. Pp. 605, with 94 illustrations. Lea & Febiger, 600 S. Washington Sq., Philadelphia 6, 1953.

The new edition has been very thoroughly revised to cover progress in the field during the past eight years, but has not increased in size. The general arrangement of material is the same. The first six chapters consider anatomy of the autonomic nervous system and its role in the general physiology of the body.

Eleven chapters deal with innervation and function of special organs and tissues. The final chapters are devoted to clinical problems in disease and injury including three chapters on autonomic neurosurgery.

Although treatment is considered in considerable detail in the final sections the text is primarily for use of students learning fundamentals of anatomy and physiology or as a reference source for research workers including those in surgery. Illustrations, type paper and bindings are all of highest quality. The bibliography is extensive and quite up to date, although not separated by subjects for use in reference except directly with the text.

This book deserves to be rated as an essential text on the autonomic nervous system for all libraries, and a valuable reference work for students and clinicians.



**INJURIES OF THE SPINAL CORD.** Edited by *George C. Prather, M.D., F.A.C.S.*, and *Frank H. Mayfield, M.D., F.A.C.S.* Cloth. Price, \$8.75. Pp. 396, with illustrations. Charles C Thomas, Publisher, 301-327 E. Lawrence Ave., Springfield, Ill.; Blackwell Scientific Publications, Ltd., 49 Broad St., Oxford, England; Ryerson Press, 299 Queen St. W., Toronto 2B, 1953.

All of the authors, contributing to this manual, have had direct experience in the management of spinal cord injuries, and this work represents experiences with various aspects of the problem during World War II.

The contributors discuss accepted practices that have been developed to save life and to render the existence of the individual more comfortable and more purposeful. The great need for further study and improved technics in management of paraplegia is continuously implied.

The neurosurgical aspects are covered in a clear and concise manner. The greatest amount of material in the volume is rightfully devoted to urological management. A most complete description of various methods that necessitate devoted and meticulous attention to the genito urinary tract of all these patients is presented. A suggested program of treatment is outlined.

The section on nutrition is particularly well handled. The book also contains sections on Associated Injuries and Complications; Treatment of Decubitus Ulcers; The General Rehabilitation Program; Orthopaedic Principles as Applied to the Rehabilitation Program, and Psychological Considerations. The book has numerous helpful illustrations and a very complete bibliography.

Each contributor concentrates on his own experiences with spinal cord injuries incurred during World War II. Different groups of patients were studied because the authors, during their military service, were stationed at varied medical installations. This, in a sense, makes their observations more valuable. The recommendations of these authors for the management of spinal cord injuries should constitute accepted and standard practice today. In the event of national emergency, if spinal cord injuries are concentrated in specialized centers and treated as outlined in this manual, we shall have the basis for a new approach for study of this serious problem.

In the opinion of this reviewer the team approach is developed but there is not sufficient emphasis on coordinated and integrated specialized treatment with specific responsibility for general supervision of the patient.

This volume should be studied by every physician who is concerned with the care of patients who have suffered injuries of the spinal cord.

**WHAT'S YOUR PROBLEM?** By *Alfred Blazer, M.D.* Cloth. Price, \$3.50. Pp. 372. Citadel Press, 222 Fourth Avenue, New York 3, 1953.

This is a well written book, and one which could be recommended to patients. The author's handling of the problems of psychosomatic disease is excellent, and would be of assistance in the management of patients who might read the book.

The style is interesting and efficient. Problems are introduced by hypothetical questions similar to those asked the author in his practice.

Since the book is directed towards laymen, the absence of documentation and the stating of opinions as facts is justified.

Particularly interesting is Dr. Blazer's tempering of the Freudian interpretation of emotional disease. He described "infantile awareness" as "fantastic." His attempt to explain stomach cramps coming from situational stress as a natural thing seems to beg the question.

This is a good book, useful to physicians in all specialties or general practice, and can be freely recommended to patients. The language is well chosen and understandable.

**SURGERY OF REPAIR AS APPLIED TO HAND INJURIES.** By *B. K. Rank, M.S. (Melbourne), F.R.C.S. (England), P.R.A.C.S.,* Honorary Plastic Surgeon, Royal Melbourne Hospital; Visiting Plastic Surgeon, Repatriation Commission, Victoria; Consulting Plastic Surgeon, Ministry of Health in Tasmania and *A. R. Wakefield, M.S. (Melbourne), F.R.C.S. (England), F.R.A.C.S.,* Honorary Plastic Surgeon, Children's Hospital, Melbourne; Honorary Assistant Plastic Surgeon, Royal Melbourne Hospital; Visiting Plastic Surgeon, Repatriation Commission, Victoria. Foreword by *Sir Gordon Gordon-Taylor.* Cloth. Price, \$8.00. Pp. 256, with 188 illustrations, some plates in color. Williams & Wilkins Company, Mount Royal and Guilford Avenues, Baltimore 2; E. & S. Livingstone Ltd., Edinburgh and London, 1953.

This book covers the care of the patient with a traumatized hand in a very comprehensive manner. It is divided into five parts. The first four have to do with the management of injuries for the most part occurring in industrial plants. The fifth part treats of the burnt hand, hand injuries in children, and the hand prosthesis.

Safety devices must be developed by industrial plants, since the most severe injuries occur in industry. The personal loss to the individual is not only a financial one, but personality changes because of long idleness

coupled with a loss of confidence and an enforced change of occupation, which is often difficult, cause family and social problems. The relationship between physician and patient must be good, so that the plan of treatment can be one that will be most satisfactory to the individual patient.

The description of the surgical anatomy is excellent and practical from the standpoint of the clinical examination, of repair and of function. Emphasis is placed upon the position of function with relation to damaged tendons, nerves and small joints and the importance of limiting the period of fixation.

Part II discusses the primary or early treatment describing the meticulous care of the wound, methods of repair and correct timing for mobilization. The third part discusses intermediate treatment which has to do with unclosed wounds, massive tissue necrosis, septic complications, etc., from the surgical point of view, and with the mobilization of the hand from the rehabilitative viewpoint. The authors are opposed to what they call "regimented physiotherapy," since heat may increase swelling and decrease function. They favor functional use of the hand by the patient and the use of mobilizing splints.

The fourth part describes the manner in which the healed hand is reviewed with regard to appearance and function, and the manner in which scars, unsatisfactory amputated stumps and mutilating injuries can be managed.

As mentioned, the final part has an excellent chapter describing the types of burns and their treatment; a chapter on hand injuries in children, and a brief discussion of the hand prosthesis.

The book is well written and filled with excellent illustrations. It is highly recommended.

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**PHYSICAL DIAGNOSIS.** By *Harry Walker*, M.D., F.A.C.P., Professor of Clinical Medicine, Medical College of Virginia, Richmond, Virginia. Cloth. Price, \$8.00. Pp. 461, with 126 illustrations. The C. V. Mosby Company, 3207 Washington Blvd., St. Louis 3, Missouri, 1952.

This text on physical diagnosis has been carefully planned and well-outlined, although in some places it lacks sufficient detail. Bold type headings of main topics make for easy reading and quick reference. There are adequate illustrative diagrams and pictures.

The chapter devoted to psychiatry is a welcome addition to a text of this type. Chapters pertaining to the heart, lungs, abdomen and female pelvic organs are especially well-written. However, the chapter devoted to the lower extremities is brief and lacks satisfactory detail. Musculoskeletal diseases and various types of arthritis are not discussed

in sufficient detail. The section devoted to peripheral vascular disorders is inadequate. Thromboangiitis obliterans, arteriosclerosis obliterans and erythromelalgia are discussed only briefly. Raynaud's disease is mentioned, but secondary Raynaud's phenomenon, livido reticulosis, acrocyanosis and the lymph edemas are omitted.

Cushing's syndrome is discussed and it is stated that the disease may be caused by a basophilic adenoma of the pituitary gland, carcinoma of the adrenals and certain ovarian tumors, while no mention is made of adrenal hyperplasia which is a common cause of Cushing's disease.

A typographical error is noted on page 382, which should read "does not result in generalized increased venous pressure with distension of the neck veins."

In general the book is satisfactory, but should be modified in future editions to cover the aforementioned omissions.

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**CHEMICAL PHYSIOLOGY OF CONTRACTION IN BODY AND HEART MUSCLE.** By *A. Szent-Györgyi*. Cloth. Price, \$4.80. Pp. 135, with 29 illustrations. Academic Press, Inc., 125 E. 23rd St., New York 10, 1953.

To understand this book, one must first be acquainted with the two previous books by the author: The first was "The Chemistry of Muscular Contraction;" the second, "Nature of Life." Upon these two books rests the groundwork leading to the present contribution.

This is a very small book but it is by no means an evening of light reading. As a matter of fact, the reader needs more than a nodding acquaintance with developments in muscular chemistry during the past twenty years to understand the complexities laid down by the author.

The book begins with the modern histology and physiology of striated muscle as a prefatory note. The body of the book is then divided into three parts. The first section is by far the most complex. The author spells out in bio-chemical and physical terms the molecular mechanism of motion, using mammalian voluntary muscle as the experimental object.

In the second section he attempts a transference of the facts learned from mammalian voluntary muscle to the heart muscle of frogs. He explains certain conflicting results in the last chapter of the section.

The third part of the book covers interpretations of some of the observed phenomena and the author philosophically theorizes the possible explanations of certain *in vivo* and *in vitro* incompatibilities.

The book is a masterpiece of pure science tempered with a philosophy and imagination

found only in a true scientist. The average clinician will be stunned by the impact of the growth of muscle chemistry from its humble beginning, as taught by most physiology departments a few short years ago, to its present complex, bio-chemical, and physical properties, which approach the answer to life itself.

If you have not read the author's three books or heard him lecture on these subjects, you owe it to yourself to read them for the fundamental background of a modern, basic science subject.

**SYNOVIAL FLUID CHANGES IN JOINT DISEASE.** By *Marian W. Ropes*, M.D., Associate Physician, Massachusetts General Hospital, Assistant Clinical Professor of Medicine, Harvard Medical School and *Walter Bauer*, M.D., Chief of Medical Services, Massachusetts General Hospital, Jackson Professor of Clinical Medicine and Director of Robert W. Lovett Memorial Foundation for the Study of Crippling Disease, Harvard Medical School. Cloth. Price, \$4.00. Pp. 150. Harvard University Press, Cambridge, Mass., 1953.

This text is the most complete and informative of any available on the study of synovial fluid in health and disease. Excellent clinical information pertaining to the various arthropathies is included with data from 1500 synovial fluid examinations. Numerous illustrative diagrams and pictures aid in the clarification of the clinical material presented.

Physiology of joint fluid is discussed in detail as well as certain information pertaining to the complex mucoproteins. Altered proteins as determined by electrophoresis and the effect of cortisone and ACTH on the synovium and synovial fluid are included.

While much of the material presented is highly technical and devoted primarily to investigation, the book is invaluable to physicians and surgeons interested in joint disease.

**THE MUSCULOSKELETAL SYSTEM.** Edited by *Mahlon Ashford*, M.D. A Symposium Presented at the Twenty-third Graduate Fortnight of the New York Academy of Medicine, October 9-20, 1950. Cloth. Price, \$6.50. Pp. 368, with illustrations. The Macmillan Company, 60 Fifth Ave., New York 11, 1952.

This book contains a fine but limited selection of well-chosen articles written by competent authorities in their respective fields of rheumatic and allied diseases.

The various chapters are well-chosen to include information pertaining to newer methods of investigation of the physiology and metabolism of muscle connective tissue and uric acid. Metabolic bone diseases are ex-

ceptionally well-reviewed. Newer concepts in the treatment of the various rheumatic diseases are presented, including a critical review of steroid therapy in rheumatoid arthritis. The chapters on gout and collagen diseases are especially well-written. Extensive bibliographies included at the end of each chapter add to the value of the text as a reference.

Perhaps the only criticism of the text is the limited discussion on rheumatic fever, lupus erythematosus and scleroderma. It would appear that these diseases should have been discussed more fully, including prophylaxis in the treatment of rheumatic fever and the newer concepts in the diagnosis and treatment of lupus erythematosus. However, the text is highly recommended and should be read by all physicians.

**CERAMIC SCULPTURE.** By *John B. Kenny*. Cloth. Price, \$7.50. Pp. 304, with illustrations by the author. Greenberg, Publisher, Inc., 201 E. 57th Street, New York 22, 1953.

This is Mr. Kenny's second book in the field of clay modeling. Because of its close relationship to the field of anatomy it will interest those in the medical sciences. Many doctors, nurses and technicians will be pleased with this introduction to a hobby or pastime. Occupational therapists may find this a useful publication in their work.

**STATISTICAL METHODS IN EXPERIMENTATION: AN INTRODUCTION.** By *Oliver L. Lacey*, Professor of Psychology, University of Alabama, University, Ala. Cloth. Price, \$4.50. Pp. 249, with 33 illustrations. The Macmillan Company, 60 Fifth Ave., New York 11, 1953.

Introductory books on statistical methods form a sort of spectrum, ranging from the rigorous and exhaustive type at one extreme, to the informal, sketchy type at the other. Reader preferences must vary widely in this field, and the present book, with its first and second personal pronouns and other tokens of informality, will appeal to a reader inclined in that direction.

Because the book is intended to deal with experimental rather than observational data, it omits a number of topics of serious moment to medical men, particularly the subject of mortality and (more generally) attrition tables. This limits its usefulness to medical students. The brief index also lacks many entries, such as binomial, contingency, Latin square, skew, and tetrachoric, which a student must sometimes look up in connection with his reading of current literature. Some key words like parameter and difficult con-

cepts like homoschedasticity deserve formal, memorizable definitions.

Commendable features of the book are its prepossessing appearance, the readable style, and the wealth of illuminating problems. It can be recommended to students as an attractive introduction to a difficult but important subject.

**THE ALKALOIDS: CHEMISTRY AND PHYSIOLOGY. VOLUME III.** Edited by *R. H. F. Manske* and *H. L. Holmes*. Cloth. Price, \$11.00. Pp. 422, with illustrations. Academic Press, Inc., 125 E. 23rd St., New York 10, 1953.

This book deals almost entirely with the chemistry of a number of types of alkaloids. The pharmacological value of these compounds is mentioned briefly and their relation to physiology scarcely at all. Therefore, this book will be of interest only to persons concerned primarily with the chemical structure and reactions of alkaloids.

**EFFECTIVE USE OF OLDER WORKERS.** By *Elizabeth Llewellyn Breckinridge*, Executive Secretary, Illinois Committee on Aging. Foreword by *Edward L. Ryerson*, Chairman, Inland Steel Company, Chicago. With special contributions by *Elizabeth Hatch*, *Curtis Gallenbeck*, *L. S. Barrus*, and *John Bromer*. Cloth. Price, \$4.00. Pp. 224. Wilcox and Follett Co., 1255 S. Wabash, Chicago 5, 1953.

The important and timely subject covered in this book is the result of a national survey directed by the author and sponsored by the University of Chicago's Committee on Human Development. It is a provocative discussion on what 90 progressive corporations are doing to solve their problem in hiring, retiring, transferring, and maintaining the health and morale of older employees. There are interesting and helpful chapters on counseling the older worker, preparing him for retirement and the post-retirement. Throughout the whole book, there is an attitude of social responsibility on the part of the corporations who took part in the study. The author clearly shows that when the health, morale, and independence of older workers is maintained, not only does the individual worker benefit, but industry, our economy, and the nation benefit as well. There is a bibliography at the end of each chapter and a selected bibliography at the end of the book.

The text is well written, interesting, and stimulating. It does not attempt to give a final conclusive answer to the problem of retirement and the older worker, but does stim-

ulate objective thinking and point up some possible answers to this ever increasing problem.

**RECURRENT DISLOCATION OF THE SHOULDER.** By *James A. Dickson*, M.D., Chief, Department of Orthopedic Surgery, Cleveland Clinic and Cleveland Clinic Hospital, *Alfred W. Humphries*, M.D., Department of Orthopedic Surgery, Cleveland Clinic and Cleveland Clinic Hospital and *Harry W. O'Dell*, M.D., Chief, Department of Orthopedic Surgery, Akron Clinic. Cloth. Price \$4.50. Pp. 158, with illustrations. The Williams & Wilkins Company, Mt. Royal and Guilford Aves., Baltimore 2, 1953.

This is a new work by the famous orthopedic surgeon of the Cleveland Clinic and his associates. In this relatively small volume comprehensive and up-to-date consideration is given to this important subject.

First the authors study the phylogeny, ontogeny and anatomy of the shoulder. The next two chapters discuss the dynamics of this joint and the pathological changes which lead to recurrent dislocation. Factors which may be responsible for the initial dislocation are given, such as the movement of the joint, the musculature, defects, and others. Line drawings and roentgenograms are used effectively. The treatment is covered by the various types of operations which have been employed since 1882. This includes twelve techniques which are discussed in some detail; the last one is termed the *Dickson-O'Dell* operation, in which the "pectoralis minor is transplanted from its coracoid insertion to the greater tuberosity of the humerus." A final chapter discusses posterior dislocation with chief consideration given to surgical repair.

A large bibliography concludes the work.

This volume should be extremely valuable to all orthopedic surgeons and other surgeons who encounter this condition frequently.

**MORRIS' HUMAN ANATOMY. A COMPLETE SYSTEMATIC TREATISE.** Edited by *J. Parsons Schaeffer*, A.M., M.D., Ph.D., Sc.D., D.Litt. Professor of Anatomy and Director of The Daniel Baugh Institute of Anatomy, Emeritus, The Jefferson Medical College. Eleventh edition. Cloth. Price, \$16.00. Pp. 1718, with illustrations. The Blakiston Company, Inc., 575 Madison Avenue, New York 22, 1953.

Any work with the world-wide recognition such as the *Morris' Anatomy* requires very little comment in a book review. The last edition appeared in 1942 so that a revision was deemed necessary by the editor. New contributors include Professor Lachman, who

collaborated with Professor Blount in the Section on the Digestive System; Professor Markel, a new author for the Urogenital System; Professor C. G. Smith, who collaborated with Professor Grant in revising the Section on Musculature; and Professor Trotter, who associated with Professor Terry in rewriting and revising the Section on Osteology and The Articulation.

The entire volume has been revised and the text brought up to date. New illustrations have been added or others replaced. The bibliography has been revised. Features that have proven helpful have been retained, such as the use of smaller types, in double columns in this edition, for items of less importance; and appropriate reference to clinical aspects and relations.

Undoubtedly this is one of the finest and most up-to-date volumes on anatomy.

**DYSARTHRIC SPEECH (SPEECH IN CEREBRAL-PALSY).** By *Emil Froeschels*, M.D. Cloth. Price, \$3.75. Pp. 172, with 34 illustrations. Expression Co., Publishers, Magnolia, Mass., 1952.

The author, according to his statement in the foreword, has attempted to write a text for both scientists and laymen by simplifying the more technical discussions. One is impressed that the attempt to present the complicated anatomy and physiology of the speech process to the lay mind is not entirely successful. On the other hand, certain features have been over-simplified for the scientist.

With the exception of the first two chapters on the relationship of the central nervous system to dysarthria and the third chapter on aphasia and apraxia, the whole volume is devoted to the discussion of the abnormal muscular mechanisms in dysarthric speech. There are chapters on etiology and symptomatology, differential diagnosis, three chapters on therapy, and one on stuttering.

The author has indicated the desirability of cooperation among the pediatricist, the neurologist, the surgeon, the speech therapist, and the "physiotherapist" in the care of the dysarthric patient. It is not clear whether author means "physical therapist" or "physiatrist." He stresses the importance of general physical therapy to accompany speech therapy in the care of these patients.

The technics used in the diagnosis and treatment of dysarthric speech disorders have been well presented. The author makes it clear, however, that the layman would not be able, simply from reading this discussion, to treat a speech disorder. Nevertheless, the treatment section of the book would be of distinct value to the layman who has a dysarthric speech problem to deal with in the home. Although some parts of the text have

been greatly simplified to meet the lay mind, the physician who is interested in this field will find much that is helpful.

**HOW TO LIVE WITH YOUR ALLERGY, HOW TO LIVE WITH YOUR ARTHRITIS, HOW TO LIVE WITH YOUR BLOOD PRESSURE, HOW TO CARE FOR THE HEALTH OF EXECUTIVES, HOW TO LIVE WITH YOUR HEART CONDITION, HOW TO LIVE WITH YOUR MIGRAINE HEADACHES, HOW TO LIVE WITH YOUR NERVES, HOW TO LIVE WITH YOUR ULCER.** By Dr. Walter C. Alvarez. Paper. Price, each title, \$.60. Wilcox and Follett Co., 1255 S. Wabash Ave., Chicago 5, 1951.

The general nature of these little books is well suggested by their titles. Their direct, unaffected, disarming style is what many readers have learned to associate with Dr. Alvarez. The best ones are those that deal with emotions and attitudes, especially the two on Migraine Headache and on the Health of Executives; here the simple philosophy of relaxation and common sense is perhaps most satisfying. In the rest there is a vagueness, and a lack of introductory anatomical and physiological information, that is good for some purposes but bad for others. When Alvarez says "nerves" he is thinking of neuroses, not of sclerosis and degenerations; when he says "ulcers" he is thinking of peptic ulcers, not the varicose or the decubitis kind. Because these books can bring much comfort to the patient when appropriately used, it might pay physicians to peruse them, and to prescribe them when needed.

**A PRIMER OF CARDIOLOGY.** By *George E. Burch*, M.D., F.A.C.P., Second edition. Cloth. Price, \$5.50. Pp. 339, with 214 illustrations. Lea & Febiger, Washington Square, Philadelphia 6, 1953.

This book is a much more ambitious undertaking than would appear in the title or preface. The author states that "this primer is intended for the medical student and physician who are interested in an introduction to cardiology."

Dr. Burch has a remarkable facility for presenting in a condensed form an excellent review of a complex subject. A companion volume by the same author "A Primer of Electrocardiography" has proven this capacity.

In the present text on Cardiology the author has succinctly supplied in its pages, pertinent theoretical and practical information for the practitioner of medicine. The



material is crystallized and the style lucid. It is dubious, however, if it is at the medical student level.

The text is replete with excellent diagrams and tables which add immeasurably to conciseness and clarity.

This book is strongly recommended for the medical library of any practitioner who requires a concise, informative — but not encyclopedic — review of the field of Cardiology.

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**ADVENTURES IN PHYSIOLOGY WITH EXCURSIONS INTO AUTOPHARMACOLOGY.** Selection from scientific publications of *Sir Henry Hallett Dale, G.B.E., F.R.S., M.D.* With introduction and recent comments by author. Cloth. Price, \$19.50. Pp. 652, with illustrations. The Macmillan Company, 60 Fifth Ave., New York 11; Pergamon Press Ltd., 2, 3 & 5 Studio Place, Kinnerton Street, Knightsbridge, London, S.W. 1, 1953.

This volume is a tribute to a great scientist and brings together a surprisingly large number of original papers of lasting importance to students of physiology.

The content of this volume is, by the author's own choice, of his reprints. His interest has been in the specific actions of adrenaline and of acetylcholine and the question of chemical transmission of nerve impulses at nerve endings. He was also particularly interested in the drug ergot and many papers deal with its remarkable pharmacological effects.

The papers of particular interest to those in the field of Physical Medicine and Rehabilitation relate to the reactions of denervated muscle, the chemical transmission of nerve impulses, and the release of acetylcholine as a transmitter of the effects of nerve impulses.

Other important papers concern the subject of histamine, anaphylaxis and vaso-dilator and depressor substances.

This is a large volume, well printed and bound and with faithful reproductions of illustrations. It is a book which all students of physiology would like to have available as a valuable reference. It is also of particular interest to students and investigators in physical medicine as this basic research applies so directly to problems of interest to physiatrists.

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**SYNOPSIS OF PEDIATRICS.** By *John Zahorsky, A.B., M.D., F.A.A.P.* Assisted by *T. S. Zahorsky, B.S., M.D.* Sixth edition. Cloth. Price, \$7.50. Pp. 470, with 167 illustrations. C. V. Mosby Company, 3207 Washington Blvd., St. Louis 3, 1953.

This synopsis was first published in 1934 and with the present edition an attempt has

been made to bring the material up to date. With so many advances in concepts and therapeutics, the selection of the most important aspects in pediatrics is rendered difficult. Obviously, in a book such as this, there will be some methods of treatment which will be disagreed upon by a few pediatricians. Several of the photographs date the book and might have been revised to depict modern concepts, e.g., more recent types of bottle feeding, aluminum or glass utensils rather than ones which chip readily. A table of indications and dosages for the newer antibiotics, sulfonamides, and other anti-bacterial drugs would have facilitated rapid reference. Nevertheless, the work in its entirety is an excellent effort to encompass ever-increasing ideas and therapies within the confines of a small but complete book.

The authors have striven to fulfill the needs not only of pediatricians, but internes as well. General practitioners and the resident staff of hospitals will also find this handy guide invaluable and practical.

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**PRIVATE WORLD OF PAIN.** By *Grace Stuart.* With appendix by *John Malins, M.B., M.R.C.P.* Cloth. Price, \$2.50. Pp. 191. George Allen & Unwin, Ltd., Ruskin House, 40 Museum Street, London, W.C. 1 (The Macmillan Company, 60 Fifth Avenue, New York 11), 1953.

This volume of somewhat less than two hundred pages encompasses the mature reflections of the author who, for many years, has lived the life of a severe rheumatoid arthritis cripple. Mrs. Stuart originally started to chronicle "the miraculous" effect of cortisone in the relief of long standing arthritic pain. However, the last chapter of the book also relates the disappointment that has been experienced by those who received cortisone only to find that it was not as great a miracle as they had hoped.

The text is well written with a great deal of keen insight into the problems faced by the chronically ill person. The material is well organized, both from a chronological and physiological point of view. This book is recommended for those practitioners of the healing art, or those who practice in relation to medicine such as physical therapists, occupational therapists, and so on, to provide a better understanding on the part of professional people. Careful reading of this book or even casual reference to its content, serves to remind one that we know very little of what goes on in the minds of our patients. Mrs. Stuart calls attention to the superficiality of contact not only on the part of the medical profession, but also on the part of others who might be supposed to have a more adequate understanding, such as the clergy and close



friends. There is much thought-provoking material in this work for those who are interested in helping people to live happier and more successful lives.

**AN INTRODUCTION TO ELECTRONICS FOR PHYSIOLOGICAL WORKERS.** By *I. C. Whitfield*, B.Sc., Ph.D. Cloth. Price, \$3.50. Pp. 236, with illustrations. St. Martin's Press, Inc., 103 Park Avenue, New York 17; Macmillan & Co., Ltd., London, 1953.

This book has been especially aimed at "physiological workers." Starting with a review of basic electronics, its twenty chapters deal progressively with more advanced phases of the subject. Some of the topics discussed are: The construction and use of the diode and multielectrode valves; hot and cold cathode tubes; photoelectric cells; amplifiers and oscillators. The book is profusely illustrated, each picture being labelled consecutively by chapter and number.

The book is well written. However, it is questionable whether students of physiatrics will find it adequate for their needs. One looks in vain for a discussion of low volt currents, high frequency currents, or ultrasonics.

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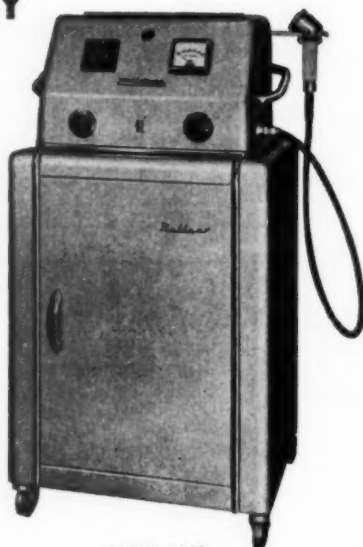
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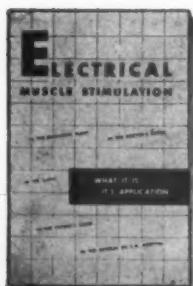


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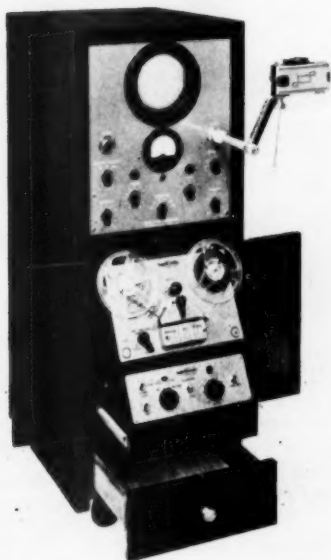
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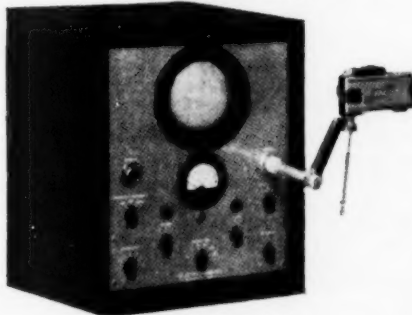


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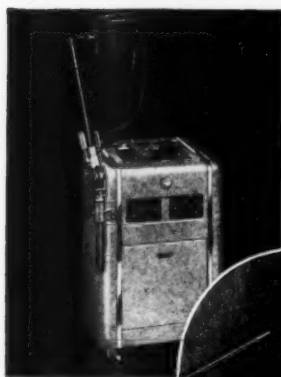
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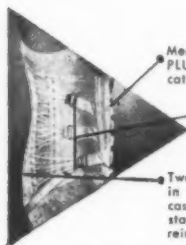
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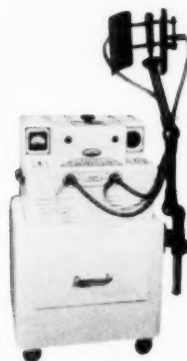
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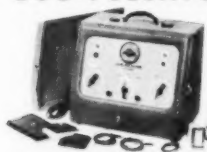
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# INSTRUCTION SEMINAR

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## 32nd Annual Scientific and Clinical Session

### American Congress of Physical Medicine and Rehabilitation

HOTEL STATLER — September 6 - 11, 1954 — WASHINGTON, D.C.

#### HEMIPLEGIA

*Tuesday, September 7*

- 9:00 - 9:50 A.M. PHYSIOLOGY OF CEREBRAL CIRCULATION. Seymour S. Kety, M.D., Bethesda, Md.  
10:00 - 10:50 A.M. ANATOMY OF CEREBRAL CIRCULATION. Othmar Solnitsky, M.D., Washington, D.C.  
11:00 - 11:50 A.M. ACUTE MANAGEMENT OF HEMIPLEGIA AND PREVENTION OF DEFORMITIES. A. David Gurewitsch, M.D., New York.  
2:00 - 2:50 P.M. GAIT TRAINING FOR THE HEMIPLEGIC. Mieczyslaw Peszczyński, M.D., Cleveland.  
3:00 - 3:50 P.M. PROSPECTS FOR THE HEMIPLEGIC ARM. Edward E. Gordon, M.D., New York.  
4:00 - 4:50 P.M. PRACTICAL MANAGEMENT OF APHASIA. Hildred Schuell, Ph.D., Minneapolis.

*Wednesday, September 8*

- 8:00 - 8:50 A.M. ACTIVITIES OF DAILY LIVING FOR THE HEMIPLEGIC PATIENT INCLUDING SELF-HELP DEVICES. Donald A. Covatt, M.D., New York.  
9:00 - 9:50 A.M. VOCATIONAL PROSPECTS FOR THE HEMIPLEGIC. James F. Garrett, Ph.D., Washington, D.C.

#### PAINFUL LOW BACK

*Tuesday, September 7*

- 9:00 - 9:50 A.M. FUNCTIONAL ANATOMY OF THE SPINE. Othmar Solnitsky, M.D., Washington, D.C.  
10:00 - 10:50 A.M. MANAGEMENT OF ACUTE LOW BACK PAIN WITHOUT RADICULAR PATHOLOGY. Hans Kraus, M.D., New York.  
11:00 - 11:50 A.M. MANIPULATIVE TECHNIQS OF THE SPINE AND INDICATIONS FOR USE. John McM. Mennell, M.B., Richmond, Va.  
2:00 - 2:50 P.M. BACK BRACES. Odon F. von Werssowetz, M.D., Gonzales, Texas.  
3:00 - 3:50 P.M. DIAGNOSIS AND INDICATIONS FOR SURGERY IN DISC DISEASE. Edward B. Schlesinger, M.D., New York.  
4:00 - 4:50 P.M. BACK PAIN AND DISABILITY AS A COMPENSATION PROBLEM. Robert B. O'Connor, M.D., Boston.

#### OSTEOARTHRITIS

*Wednesday, September 8*

- 8:00 - 8:50 A.M. PATHOGENESIS AND MEDICAL MANAGEMENT. Walter M. Solomon, M.D., Cleveland.  
9:00 - 9:50 A.M. THERAPY IN PHYSICAL MEDICINE. Arthur L. Watkins, M.D., Boston.

Note: The Committee on Advances in Education of the American Congress of Physical Medicine and Rehabilitation is in charge of the instruction seminar. It is purposely planned to limit the subjects this year to three which will be covered in considerable detail both from clinical and basic science points of view. It is normally planned that the larger and more important subjects will be repeated every three to five years.

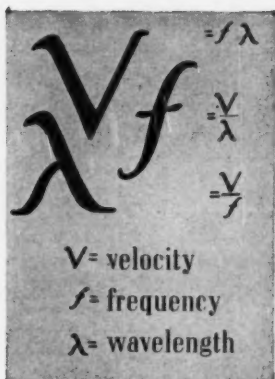
Courses are offered as previously in two separate groups. However, as a trial this year, the distinction has been eliminated between the basic science group and the clinical group. Each group, and in many cases each lecture, will deal with basic science as well as clinical aspects. Physicians as well as physical therapists who are registered with the American Registry of Physical Therapists will be permitted to register for these courses. Members in good standing of the American Occupational Therapy Association are also eligible to enroll for the seminar.

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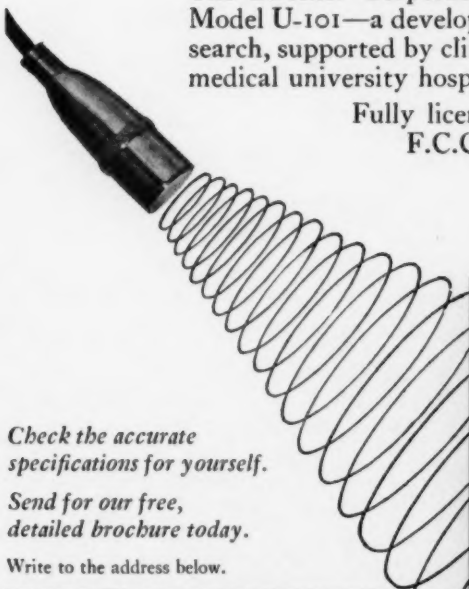
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